

# YouTube as a Source of Information for Fluoride Treatment: a Content and Quality Analysis

## Florür Tedavisi ile İlgili Bir Bilgi Kaynağı Olarak YouTube: İçerik ve Kalite Analizi

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### ABSTRACT

*Introduction:* Fluoride treatment has a critical role in preventive dentistry and oral health. Determining the level of information that patients can access via YouTube is considerable for the knowledge of clinicians about the patient's approach to treatment. The aim of this study is to evaluate the quality of information on YouTube videos about fluoride treatment.

*Methods:* In Google Trends on November 14, 2019, fluoride treatment was identified as the most popular keyword and 86 videos of the first 120 videos were included. The content was evaluated considering some sub-topics on 10 points score. Video information and quality index (VIQI) was evaluated using a 5-point score. Statistically, Mann Whitney-U, Chi-Square and Spearman correlation analyses were performed.

*Results:* 86 videos were divided into two groups as low content (%66.3, n=57) and high content videos (%33.7, n=29) considering the total content scores of each video. A significant difference was found in the total VIQI scores ( $p < 0.001$ ) and video lengths ( $p = 0.003$ ) between groups. The most frequently mentioned content was professionally-applied topical fluoride treatments (76.7%). 51.2% of the videos were uploaded by the dentist/specialist.

*Discussion and Conclusion:* Although most of the videos were uploaded by dentists and specialists, the contents were insufficient.

**Keywords:** Fluoride treatment, Fluoride, Social Media, VIQI, YouTube

### ÖZ

*Giriş ve Amaç:* Florür tedavisi, koruyucu diş hekimliği ve ağız sağlığında kritik bir role sahiptir. Hastaların YouTube üzerinden erişebilecekleri bilgi düzeyinin belirlenmesi, klinisyenlerin hastanın tedaviye yaklaşımı hakkında bilgi sahibi olması açısından önemlidir. Bu çalışmanın amacı, florür tedavisi ile ilgili YouTube videolarındaki bilgilerin kalitesini değerlendirmektir.

*Yöntem ve Gereçler:* 14 Kasım 2019 tarihinde Google Trend ile florür tedavisi en popüler anahtar kelime olarak belirlenmiş ve ilk 120 videonun 86 videosuna yer verilmiştir. İçerik, bazı alt başlıklar dikkate alınarak 10 puan üzerinden değerlendirilmiştir. Video bilgileri ve kalite indeksi (VIQI), 5 puanlık bir skorlama kullanılarak değerlendirilmiştir. İstatistiksel değerlendirmeler için Mann Whitney-U, Ki-Kare ve Spearman korelasyon analizleri yapılmıştır.

*Bulgular:* 86 video, her videonun toplam içerik puanları dikkate alınarak düşük içerikli (%66.3, n=57) ve yüksek içerikli videolar (%33.7, n=29) olmak üzere iki gruba ayrılmıştır. Gruplar arasında toplam VIQI skorlarında ( $p < 0,001$ ) ve video uzunluklarında ( $p = 0,003$ ) anlamlı fark bulunmuştur. En sık bahsedilen içerik, profesyonel olarak uygulanan topikal florür tedavileri olarak belirlenmiştir (%76,7). Videoların %51,2'si diş hekimi/uzman tarafından yüklenmiştir.

*Tartışma ve Sonuç:* Videoların çoğu diş hekimleri ve uzmanlar tarafından yüklenmesine rağmen, video içerikleri yetersiz bulunmuştur.

**Anahtar Kelimeler:** Florür Tedavisi, Florür, Sosyal Medya, VIQI, YouTube

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## INTRODUCTION

Oral health is a unique issue that is related general health and quality of life. Oral diseases required costly treatments are worldwide endemic and important public health problems.<sup>1</sup> Although dental caries is a predictable and preventable non-communicable disease it was estimated that it is the most prevalent disease in the world.<sup>2,3</sup>

Topical fluoride, systemic fluoride and fluoridated kinds of toothpaste are the most studied preventive factors of dental caries and effective for the treatment of initial lesions.<sup>4</sup> Prevalence and severity of dental caries decreased with community water fluoridation after the 1960's in The United States of America and also The Cochrane Oral Health Group reported a similar reduction in 2015.<sup>5,6</sup> Fluoride is considered a safe and effective way to prevent dental caries if it is used properly. Although some adverse effects were reported such as decreasing cognitive ability, cancer and endocrine disorders, they did not evidence to prove fluoride is not safe when properly used for the prevention of dental caries.<sup>5</sup> World Dental Federation (FDI), World Health Organization (WHO), American Dental Association (ADA), American Academy of Pediatric Dentistry (AAPD) and European Academy of Pediatric Dentistry (EAPD) recommend individuals choose the systemic and topical fluoride treatments against caries risk and intake of fluoride by community water.<sup>2,4,7-9</sup>

Internet and social media are attractive ways to obtain health information so that more than 80% of internet searches are related to medical issues.<sup>10</sup> One of the third most visited websites YouTube is a good alternative with visual and audio information together and also provides an easy, fast and international source of information.<sup>11</sup> YouTube and other social media websites are not only searched by laypeople but also by professionals who need to have relevant information. YouTube is an open-source platform and there is no method to control the topic and the content of videos which means everybody can easily upload information regardless of relating the topic with the video uploader. Therefore, this situation causes much speculative information to be uploaded on the platform. With the increased use of social media, patients are more prone to use these platforms to find the information they need. Therefore, information content and quality analysis are conducted due to the increased number of YouTube videos in the fields of both medicine and dentistry.<sup>10,12-14</sup> In this way, we can aware of how the patients may be informed about a subject and we can determine the current level of knowledge which then can be used to increase the level of content of videos.

Despite the limitations of studies reporting that fluoride is a developmental toxin and causes mental retardation, this issue has made a strong impression in the press and on the Internet. Because the fluoride treatment is an up-to-date and important issue, discussions about

the necessity of this treatment results with the increasing number of posts and videos on the Internet and social media posts on these websites are open to everyone, which make the information accessible by both professionals and non-professionals. YouTube which combines the audio and visual contents, is one of the most frequently followed social media tools for acquiring information. There are a limited number of studies that analyze the posts on social media about fluoride treatment. The aim of this study is to analyze the content and quality of YouTube videos on fluoride treatment.

## METHODS

Ethics committee approval was not required as the data used in this study was obtained from a public platform. The keywords required for determining YouTube videos in this study were determined by using the Google Trends application. The search was limited to the last five years in "Incognito"/"Worldwide" settings to prevent restrictions based on user history and to expand search results. First, some keywords related to the main topic were analyzed using the application. At this time, the suggested alternative keywords of the application were considered as a potential keyword for the study. After a comparative search between the keywords, "fluoride treatment" was determined to be the keyword for the YouTube search.

A search was made on YouTube on November 14, 2019 with the keyword "fluoride treatment" in order to specify the videos to be evaluated in the context of fluoride treatment. Relevance level was determined as ranking criteria on YouTube. No other filter was used. The first 120 videos were included for possible analysis. There are studies that analyzed different numbers of videos in the literature. It has been shown that many internet users do not extend their search beyond the third page of the results. When we consider the possible number of excluded videos during the analysis, we included 120 videos at the beginning of the study. The videos obtained as a result of the search with the YouTube variables specified on the above date were recorded by making a playlist. So, subsequent changes in study results were prevented. Repetitive videos, non-English videos, videos only with audio or silent videos, videos longer than 15 minutes were excluded. Videos consisting of multiple parts were considered as a single video. 34 videos were excluded due to the above-mentioned reasons.

In order to determine the content levels of the videos, various information was determined and the videos were scored according to this information content. The total content score of each video was calculated over a total of 10 points. Each content was scored as 1-point and a video can be scored maximum 10 points for the number of 10 contents. The guideline of AAPD was taken as a reference for video content evaluation criteria. These

criteria were; definition, its mechanism of action, indications, an application period of topical fluoride, systemic fluoride (community water fluoridation and fluoride supplements), home-use fluoridated products, professionally-applied topical fluoride treatments, clinical application of topical fluoride, things to be considered after application and adverse effects of fluoride. "Fluoride therapy" guide updated in 2018 by AAPD was used for scoring the content. Videos which had 5 or higher scores were determined as high content videos while videos with a total content score lower than 5 were determined as low content videos.

5 different groups were determined for determining the source of the video: Dentist/specialist, hospital/university, commercial, layperson or other. The target audience were grouped as layperson, professional or layperson/professional. Video information and quality index (VIQI) was used in order to determine video quality. Each video was evaluated in this index considering (1) flow of information, (2) information accuracy, (3) quality (one point each for use of still images, animation, interview with individuals in the community, video captions, and a report summary), and (4) precision (level of coherence between video title and content). The VIQI is a 5- point Likert Scale between the ranges 5 (high score) and 1 (low score). Each VIQI content was scored using this scale and the total VIQI score for each video was determined.

For each video, the number of likes, dislikes, total number of comments, the number of views, the duration of the video, number of days after the first upload of the video was scored. Finally, interaction index and viewing rates were calculated and noted. Formulas used for calculating these indexes are described below:

Interaction index; (number of likes –number of dislikes) / total number of views X 100

Viewing rate: total number of views/ number of days after the first upload of the video X100

### Statistical Analysis

All statistical analyses were conducted on SPSS software (version 22, SPSS Inc, Chicago, USA). Shapiro-Wilk test was used to evaluate the distribution of the data. Independent Samples t-test was used to compare the YouTube variables between high and low content videos for normally distributed data and Mann-Whitney U test for non-normally distributed data. Differences between the two groups in terms of the video source and target audience were evaluated with the Chi-square test. The correlation between total content score, VIQI score and YouTube variables were evaluated by calculating Pearson correlation coefficients. A randomization site was used to determine 60 videos and these videos were re-evaluated by the same researcher after 1 month. Intra-observer reliability was determined by calculating intra-

class correlation coefficient (ICC). Again, data of two different researchers were compared and the interclass correlation coefficient was calculated to evaluate inter-observer reliability. The significance level was determined as  $p < 0.05$

### RESULTS

Thirty-four videos were excluded and were not analyzed. The number of videos for each exclusion criteria are presented on Table 1. Descriptive statistics of YouTube variables are shown in Table 2. The highest number of views was 576348 while the mean number of views was 20987.14. The longest video was 900 seconds. Mean video duration was measured at 202.33 seconds. The mean interaction index was 0.78. Interaction index ranged between -0.65 and 13.33. The average number of views was 1429.03.

Mean total content score and mean VIQI score were  $3.85 \pm 2.03$  and  $14.36 \pm 3.69$  for all videos included, respectively. The highest VIQI score was observed in a precision variable ( $3.75 \pm 1.09$ ). Most of the videos were uploaded by dentist/specialist group ( $n=44$ , 51.2 %). The target audience of the vast majority of analyzed videos were the professional group ( $n=56$ , 65.1%) (Table 2).

**Table 1:** Numbers of excluded videos the reasons for their exclusion

Reasons for Exclusion	n
No audio	11
No video	0
Not in English	7
Not related to the topic	9
Duplicated video	4
Video length is more than 15 min	3
Total	34

Intra-observer and inter-observer reliability were found between 0.910-0.943 and 0.871-0.902, respectively. It was found that intra-observer and inter-observer reliability were high.

According to the total content scores, 29 videos were determined as high content video and 57 videos as low content video. The subjects most frequently mentioned in high content videos were definition of fluoride treatment ( $n=28$ , 96.6%) and professionally applied topical fluoride treatments ( $n=28$ , 96.6%) while the least mentioned subjects were application period of topical fluoride ( $n=10$ , 34.5%) and post-treatment precautions ( $n=10$ , 34.5%). On the other hand, a subject that were most frequently mentioned in low content videos was professionally applied topical fluoride treatments ( $n=38$ , 66.7%) while the least mentioned subjects were the application period of topical fluoride ( $n=3$ , 5.3%) and systemic fluoride ( $n=3$ , 5.3%) (Table 3).

**Table 2:** Descriptive statistics of videos

Variables	Minimum	Maximum	Mean	Standard Deviation
<b>Video Demographics</b>				
Number of views	8	576348	20987.14	77103.53
Number of likes	0	16140	363.81	2097.43
Number of dislikes	0	682	18.22	84.29
Number of comments	0	2398	57.15	330.01
Video duration	19	900	202.33	204.36
Days since upload	14	3830	1493.25	1100.67
Interaction index	-0,65	13.33	0.78	1.91
Viewing rate	2.11	28321	1429.03	4377.65
Total Content Score	1	9	3.85	2.03
<b>Video Information and Quality Index (VIQI)</b>				
Flow	1	5	3.34	1.09
Information Accuracy	1	5	3.7	1.11
Quality	1	5	3.58	1.14
Precision	1	5	3.75	1.09
Total Score	5	20	14.36	3.69

**Table 3:** Distribution of video demographics in high and low-content video groups

Video Demographics	High Content Videos (n= 29)	Low Content Videos (n= 57)	Total n (%)
<b>Ownership</b>			
Dentist/specialist	14 (48.3)	30 (52.6)	44 (51.2)
Hospital/university	8 (27.6)	9 (15.8)	17 (19.8)
Commercial	0 (0)	4 (7)	4 (4.7)
Layperson	1 (3.4)	4 (7)	5 (5.8)
Other	6 (20.7)	10 (17.5)	16 (18.6)
Total	29 (100)	57 (100)	86 (100)
<b>Target audience</b>			
Layperson	4 (13.8)	4 (7)	8 (9.3)
Professional	15 (51.7)	41 (71.9)	56 (65.1)
Layperson/Professional	10 (34.5)	12 (21.1)	22 (25.6)
<b>Content</b>			
Definition	28 (96.6)	24 (42.1)	52 (60.5)
Its mechanism of action	22 (75.9)	10 (17.5)	32 (37.2)
Indications	21 (72.4)	12 (21.1)	33 (38.4)
Application period of topical fluoride	10 (34.5)	3 (5.3)	13 (15.1)
Systemic fluoride	16 (55.2)	3 (5.3)	19 (22.1)
Home-use fluoridated products	15 (51.7)	6 (10.5)	21 (24.4)
Professionally-applied topical fluoride treatments	28 (96.6)	38 (66.7)	66 (76.7)
Clinical application of topical fluoride	19 (65.5)	31 (54.4)	50 (58.1)
Post-treatment precautions	10 (34.5)	16 (28.1)	26 (30.2)
Adverse effects of fluoride	12 (41.4)	9 (15.8)	21 (24.4)

There was a significant difference between high and low content video groups for mean video duration ( $p=0.003$ ). Videos in the high content group were longer compared to the low content group ( $266.06\pm 210.06$ ,  $169.89\pm 195.32$ , respectively). Differences between other

YouTube variables were not statistically significant ( $p>0.05$ ). Difference between mean VIQI scores was statistically significant between video groups ( $p<0.001$ ). Each VIQI variable were higher in high content videos compared to the low content group (Table 4). Both low

content and high content videos were most frequently posted by dentists or specialists and least posted by the public. Professionals constituted the most targeted audience in both groups. There was no significant difference between high content and low content groups in terms of source of the video ( $p=0.408$ ) and target audience ( $p=0.173$ ).

A high correlation was observed between total content score and VIQI score ( $=0.611$ ;  $p<0.01$ ). Also, a moderate correlation was found between total content score and video duration ( $r=0.389$ ;  $p<0.01$ ). The highest correlation with VIQI score was observed between video duration ( $r=0.444$ ;  $p<0.01$ ) and viewing rate ( $r=0.413$ ;  $p<0.01$ ) (Table 5).

**Table 4:** Comparison of variables between high and low-content videos

Variables	High Content Videos	Low Content Videos	p
	Mean±SD	Mean±SD	
<b>Video Demographics</b>			
Number of views	23564.55 ± 79284.51	19675.82 ± 76671.05	0.376
Number of likes	443.966±2057.50	323.03±2134.41	0.101
Number of dislikes	33.48±127.15	10.45±50.18	0.118
Number of comments	91.37±444.24	39.73±256.36	0.053
Duration	266.06±210.06	169.89±195.32	0.003*
Days since upload	1268.20±995.51	1607.65±1141.82	0.193
Interaction index	0.74±1.04	0.80±2.23	0.224
Viewing rate	2062.61±5288.76	1106.68±3845.62	0.111
<b>Video Information and Quality Index (VIQI)</b>			
Flow	4.10±0.93	2.94±0.96	<0.001*
Information Accuracy	4.24±0.78	3.42±1.15	0.002*
Quality	4.48±0.68	3.12±1.04	<0.001*
Precision	4.20±0.72	3.51±1.17	0.009*
Total Score	17.03±2.32	12.98±3.52	<0.001*

† SD indicates standard deviation

\* $p < 0.05$ , statistically significant; bold forms indicated statistical significance

**Table 5:** Correlation matrix displaying pearson correlation coefficients between scores for Total Content Score, VIQI, and YouTube Demographics

Variables	Total Content Score	VIQI	Number of views	Number of Likes	Number of Dislikes	Number of Comments	Video Duration	Days since upload	Interaction index	Viewing rate
Total Content Score	1	0.611**	0,188	0.235*	0.236*	0.218*	0.389**	-0.124	0.063	0.264*
VIQI	1	0.611**	0.340**	0.328*	0.273*	0.140	0.444**	-0.075	0.134	0.413**

\* $p<0.05$ ; \*\* $p<0.01$

## DISCUSSION

In the present study, we searched for an answer to the question of what is the quality and scope of the information is can be found on YouTube videos about fluoride treatment which still appears a current topic of debate.

Fluoride treatment is an important factor proven to be effective in preventive dentistry, incorrect and incomplete information about this treatment can cause the society to be misled.<sup>3,7-9,15</sup> Therefore, evaluation of the level of possible knowledge that patients can achieve by YouTube may have considerable influence to direct the patients to the right sources and improve oral health. Because the YouTube is one of the most frequently

visited social media tools for patients and professionals to get medical information or transfer information<sup>10,11,16,17</sup> and consequently affect the public's orientation to medical issues.<sup>10,17</sup>

There are many studies evaluating the content of YouTube videos on medical subjects such as neurosurgery, rheumatology and cancer.<sup>14,18-23</sup> In the dental literature; although there are studies evaluating videos about dental anxiety, education, various diseases and treatments, there is no detailed study analyzing the content and quality of YouTube videos about fluoride treatment.<sup>13,14,16,24-27</sup> Previous studies evaluating social media about the water fluoridation focused on only the rates of supporters and opponents of water fluoridation and their arguments.<sup>12,23</sup> In a social media study carried

out between 2011 and 2012 with “fluoridation” and “fluoride” keywords; it was found that a number of YouTube videos, tweets and Facebook pages against fluoride are more than the ones that support fluoride.<sup>12</sup> However, water fluoridation is only one of the components of systemic fluoride as a method of fluoride treatment. In the present study, we took the AAPD guideline as a reliable reference in determining the scope of contents about fluoride treatment.<sup>4</sup> This is the first study which evaluated the content and information quality of YouTube videos about the fluoride treatment.

Recently, the increasing popularity of social media instruments among the society including laypersons and professionals was one of the important reasons on the increasing number of studies that assess the content and quality of social media posts.<sup>12-14,24-26,28</sup> But in the most of the previous studies, video content analysis is not detailed as information is not provided as to what content should be mentioned or enhanced.<sup>12, 29</sup> Therefore, we took reference to the “Fluoride therapy” guideline of AAPD to determine the contents and evaluate the quality of information.

When a probable correlation between YouTube demographic data, total content score and video information and quality score evaluated, a high correlation was observed between total content score and video information and quality score. This can be interpreted that when the content of the videos increased, the quality of the videos increased, too. A moderate positive correlation was observed between video content and quality score and video duration and viewing rate. Although these results show that more quality videos were preferred more, they might be speculated as being the selection of professionals which were the most targeted for the audience in favor of more quality videos. Although most of the videos on the subject were uploaded by dentists or specialists, video contents were found insufficient in the majority of them.

Subjects most frequently mentioned on the videos were “definition”, “clinical application of fluoride” and “professionally-applied fluoride treatments”. This might be considered as a result of the fact that the target audience was predominantly professionals. Also, there is no significant difference between videos uploaded by professionals and laypeople in terms of “total content score” might be explained by the fact that professionals use the YouTube platform only to advertise and show application steps to patients/clinicians. The most frequently mentioned subjects were professionally applied fluoride treatment, definition and clinical application of topical fluoride also support this view. Systemic fluoride was subjected in only a few numbers of videos. This might be interpreted in the same way and

makes us believe that it is not often prescribed by the clinicians due to the reasons such as fluoridation of waters and fluorosis risk.

Although the internet and social media are the easiest tools to reach information today, the fact that it is not possible to control the information content creates question marks on in what ways the patients who have reached these resources might have been informed. YouTube is often used for informative purposes as it is a platform full of visual components. Therefore, it is important to identify what type of information is provided to patients particularly about a speculated subject such as fluoride. Results obtained in the study will make it possible to identify the negative aspects of information flow on YouTube and other social platforms and to determine new strategies to improve the contents. In this study, accessible and inaccessible information about fluoride on YouTube content was determined and detailed information was provided about demographic data of this information.

The studies evaluate the social media content may have several limitations. Content and demographic data of videos constantly change due to the dynamic nature of YouTube. Moreover, despite the determination of keywords of the study with Google Trends application, it must be taken into account that people might search with different keywords that cause variations in content analysis.

## CONCLUSIONS

Although most of the videos were uploaded by dentists and specialists, the contents were insufficient about fluoride treatment on YouTube. The most mentioned topics were professionally applied topical fluoride treatments and definition of fluoride treatment. But a few videos included information about application period of topical fluoride and systemic fluoride. YouTube cannot be considered as a suitable source of information for patients about fluoride treatment.

Although fluoride treatment is an important factor proven to be effective in preventive dentistry, incorrect and incomplete information about this treatment can cause the society to be misled. The knowledge of dentists about possible information that patients or society can access is important in order to direct their patients to the right sources during this information process. It was revealed in this study that non-governmental organizations consisting of professionals should share evidence-based scientific data involving high information content in an understandable way for people from all walks of life.

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