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YouTube™ Videos about Silver Diamine Fluoride in Pediatric Dentistry as a Source of Information : A Cross Sectional Analysis

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ABSTRACT

Purpose: The current study aims to evaluate the quality and reliability of silver diamine fluoride videos available on YouTube™.

Methods: The term **'silver** diamine fluoride' was used in a YouTube™ search. Sixty-nine videos screened and 40 of them were chosen for the study's analysis following the application of the inclusion criteria. The videos' parameters, including the number of views/ likes/ dislikes/ comments, days since the upload, length, interaction index, viewing and like rate were collected. The videos included in the study were evaluated according to total content score, Journal of the American Medical Association Scale (JAMAS), Video Information and Quality Index (VIQI) and Modified Global Quality Score (mGQS).Videos with 0–6 points were considered to have poor content, while those with 7–13 points were determined to have high content, based on the overall content scores.

Results: An average total content score of 5,03 ± 2,84 out of 13 was found in the outcomes of the study. 72.5% of the videos were categorized as low content and 27.5% as high content. The length of high-content videos is significantly larger than low-content videos ($p < 0.05$). VIQI, JAMAS and mGQS values of high content videos are statistically significantly higher than low content videos ($p < 0.05$).

Conclusions: YouTube™ videos related to silver diamine fluoride in pediatric dentistry were found to be poor in quality and low in content. International associations and universities may be take a responsibility for production of high-quality videos about silver diamine fluoride in line with current guidelines.

Keywords: Silver diamine fluoride; YouTube; video analysis; preventive dentistry; health information

INTRODUCTION

Globally, dental caries is still quite common in many nations for both primary and permanent teeth[1]. Silver diamine fluoride application was seen as a non-invasive and attractive technique to control dental caries because of its comparatively cheap cost and ease of usage, particularly in situations when traditional restorative procedures were not appropriate[2]. A combination of fluoride and silver nitrate, known as

silver diamine fluoride, has antibacterial and remineralizing properties. The substance promotes the remineralization of enamel and dentin by limiting biofilm densities and impeding collagen breakdown, which stops the progression of caries.

A typical side effect of silver diamine fluoride therapy is the caries lesions becoming permanently stained black[3]. Silver diamine fluoride has been utilized in concentrations ranging from 10% to 38% in Japan, China, Brazil, and Argentina since the last decade of the 1960s[4]. Silver diamine fluoride was approved by the Food and Drug Administration in 2014 for using dentin hypersensitivity over 21 years of adults in the United States[5] and was added to the World Health Organization Model List of Essential Medicines in 2021 for use in both adults and children[6].

It has been noticed that patients and their relatives use social media to obtain information about silver diamine fluoride application. Digitalization has made it much simpler and quicker than ever before to get information from several social media sites. Among the most reputable information sources are websites that allow users to share videos, and YouTube™ is the most well-known of them[7]. Nevertheless, there is no assurance regarding the quality of this online material, therefore it may mislead users. This can be the particular reason for many studies have been done to evaluate the accuracy of the data offered by YouTube™ videos on medicine[8,9], dentistry[10–14], and other health-related topics.

The literature is absent for any data evaluating the reliability of YouTube™ videos on silver diamine fluoride. This study aimed to examine the quality and reliability of information provided by YouTube™ for patients seeking information about silver diamine fluoride, to fill a gap in the literature. The null hypothesis was that there is no correspondence between the taken scores from the Video Information and Quality Index(VIQI), Journal of the American Medical Association Scale (JAMAS), Modified Global Quality Score (mGQS) and content quality.

MATERIAL AND METHODS

Ethics committee approval was not required for this study as the data was collected from a public platform. On October 18, 2023, a YouTube™ (http://www.youtube.com) search was performed. According to the "Google Trends" tool, the search term "silver diamine fluoride" was chosen. Only the first three pages of search term were taken into consideration, as studies have shown that fewer than 17% of users will explore past the first three pages of search results (8). Video source locators (URLs) were backed up and saved. Videos were also categorized into three main groups according to their uploaders separated by: (1) dentist/healthcare professional/ dental clinic, (2) university/dental association and (3) companies/commercial. The inclusion criteria were (1) the video was in English (2) the main content was related to silver diamine fluoride (3) the video had an acceptable video quality. Exclusion criteria were (1) not in English, (2) no audio or written narration, (3) duplicate videos, (4) not related to the subject and (5) longer than 25 minutes. The search methodology is outlined in **Fig 1**.

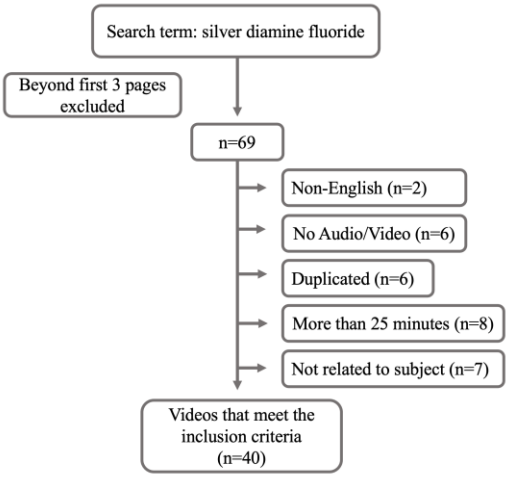

Figure 1. Selection of YouTube™ videos

Each video was independently assessed by one reviewer (A.A.). Video attributes were noted including origin country, upload source, video type (educational / patient experience), number of views/ likes / dislikes / comments, video duration, and date of upload.

Quality Evaluating Tools for Videos

Total Content Score

The content quality of the videos was evaluated according to the parameters prepared according to guideline of using silver diamine fluoride by American Association of Pediatric Dentistry (3) shown in **Table 1**. Each video was scored according to these parameters to determine the "total content score" of the video, ranging from 0 to 13. According to the total content scores, videos with 0-6 points were considered as low content and videos with 7-13 points were considered as high content.

Table 1. Parameters to evaluate the content quality score of YouTube™ videos about silver diamine fluoride

Description	Maximum Score
Definition of silver diamine fluoride	1
Mechanism of silver diamine fluoride	1
Indications	1
Contraindications	1
Advantages	1
Disadvantages	1
Examples of silver diamine fluoride	1
Application of silver diamine fluoride	1
Restoration options	1
Precautions	1
Complications	1
Prognosis and survival	1
Cost information	1
Total content score	13

Journal of the American Medical Association Scale (JAMAS)

Four distinct criteria make up the recommended JAMAS benchmark criteria (score 0–4). 4 criteria are listed as (1) authorship, (2) attribution, (3) validity and (4) explanation. Each item is given one point, and the scale offers a general evaluation of the quality of the source. High source quality is indicated by a total score of 4, while low quality is indicated by a score of 0 [15].

Video Information and Quality Index (VIQI)

The general quality of the video was evaluated using the Video Information and Quality Index (VIQI). Four criteria listed as VIQI-1 flow of information, VIQI-2 information accuracy, VIQI-3 quality and VIQI-4 level of coherence between title and content was scored by a five-item Likert scale [8].

Modified Global Quality Score (mGQS)

Every video was rated using the modified Global Quality Scale as well **(Table 2)**. A five-item Likert scale was used to assess the video's value for patients depending on the information's flow and quality [16].

Table 2. Modified global quality score

mGQS	Description
1	Poor quality, poor flow of the video, most important information missing, not at all useful for dentists
2	Generally poor quality and poor flow, some information listed but many important topics missing, of very limited use to dentists
3	Moderate quality, suboptimal flow, some important information is adequately discussed but others poorly discussed, somewhat useful for dentists
4	Good quality and generally good flow. Most of the relevant information is listed, but some topics not covered , useful for dentists
5	Excellent quality and flow, very useful for dentists

Using the number of likes, dislikes, total views, and upload times, the like rate, viewing rate and interaction index were computed for every video using the formulas shown below.

Like Rate:

$$\frac{Number\ of\ Likes}{Number\ of\ Likes + Dislikes} \times 100$$

Viewing Rate:

$$\frac{Total\ Views}{Days\ after\ upload} \times 100$$

Interaction Index:

$$\frac{Number\ of\ Likes - Number\ of\ Dislikes}{Total\ Views}$$

Statistical Analysis

All statistical analyses were performed by using IBM SPSS Statistics for Mac OS, Version 25.0, Released 2017 (IBM Corp., Armonk, NY, USA). Minimum, maximum, percentages, averages, and total scores were calculated using descriptive statistics. Independent sample t-test was used to compare the two group comparisons. One-way Analysis of Variance and Post-Hoc Tukey test were applied for multiple group comparisons. *P* values < 0.05 were considered significant for all analyses.

RESULTS

The first 69 videos in the search result were watched after entering "silver diamine fluoride" into YouTube™. Among them, 29 were removed for the reason of not fulfilling the requirements for inclusion. The descriptive statistical features of the videos seen are shown in **Table 3**.

The average number of views for videos on silver diamine fluoride on YouTube™ was 25798,63±75410,54. The mean range of audience interactions was 125,67 (between 0-1400) likes and 8,30 (between 0-192) dislikes. The results showed an average total content score of 5,03 ± 2,84 out of 13. The percentage of videos with low content was 72.5% (n=29), and the percentage of videos with high content that scored 6 points or more was 27.5% (n=11).

The majority of the uploaders of the videos are from the United States of America with the percentage of 62.5. While 77.5% of the analyzed videos were educational and 22.5% were about patient experiences. It was determined that 33 (82,5%) videos on silver diamine fluoride were created by dentists/healthcare professionals/ dental clinics, only 2 (5%) videos by universities/dental associations and 5 (12,5%) videos by companies/commercials. **(Table 4)**

Table 3. Descriptive statistics of YouTube™ videos (n=40)

Variables	Minimum	Maximum	Mean	SD
Number of views	5	459046	25798.63	75410.54
Number of likes	0	1400	125.67	264.56
Number of dislikes	0	192	8.30	30.27
Number of comments	0	199	14.05	34.02
Duration in minutes	1.07	23.41	5.63	4.80
Days since upload	1	2671	1383.67	763.97
Interaction index	0	24.62	1.53	3.85
Viewing rate	2.99	19320.11	1412.33	3242.92
Like rate	81.81	100.00	97.09	4.62
Total content score	1	12	5.03	2.84
VIQI-1	1	5	2.50	1.17
VIQI-2	1	5	2.70	1.24
VIQI-3	1	5	2.32	1.24
VIQI-4	1	5	2.45	1.17
Total VIQI score	4	20	9.95	4.46
Authorship	0	1	0.57	0.50
Attribution	0	1	0.23	0.42
Validity	0	1	0.13	0.33
Explanation	0	1	0.18	0.38
Total JAMA score	0	4	1.10	1.21
mGQS	1	5	2.63	1.07

Abbreviations: VIQI, video information and quality index ; JAMA, journal of American Medical Association scale ; mGQS, modified global quality scale ; SD: standard deviation

Table 4. Demographic variables of low and high content videos

Demographics	Low Content (n=29)	High Content (n=11)	Total n (%)
Origin Country			
Canada	3 (10.3)	0 (0)	3 (7.5)
India	1 (3.5)	2 (18.2)	3 (7.5)
Switzerland	1 (3.5)	0 (0)	1 (2.5)
United Kingdom	6 (20.7)	2 (18.2)	8 (20)
United States of America	18 (62.0)	7 (63.6)	25 (62.5)
Total	29	11	40
Upload Source			
Dentists/Healthcare professional	23 (79.3)	10 (90.9)	33 (82.5)
University/Dental association	1 (3.5)	1 (9.1)	2 (5)
Companies/Commercial	5 (17.2)	0 (0)	5 (12.5)
Video Type			
Educational	20 (68.9)	11 (100)	31 (77.5)
Patients experience	9 (31.1)	0 (0)	9 (22.5)

Table 5. Comparison of variables between low and high content videos

Variables	Low Content (n=29)		High Content (n=11)		*p value*
	Mean	SD	Mean	SD	
Number of views	26701.83	85017.91	23417.45	43945.35	0.004*
Number of likes	110.97	263.70	164.45	275.65	0.575
Number of dislikes	9.83	35.40	4.27	6.40	0.611
Number of comments	16.69	39.06	7.09	12.92	0.433
Duration in minutes	4.28	3.08	9.20	6.62	0.036*
Days since upload	1344.41	809.64	1487.18	651.55	0.604
Interaction index	0.75	0.62	3.58	7.09	0.215
Viewing rate	1404.57	3546.42	1432.78	2407.93	0.981
Like rate	96.57	5.24	98.44	2.04	0.118
Total content score	2.03	0.77	3.73	1.19	0.001*
VIQI-1	2.24	0.87	3.91	1.30	0.002*
VIQI-2	1.93	0.92	3.36	1.43	0.009*
VIQI-3	2.03	0.86	3.55	1.21	0.002*
VIQI-4	8.28	2.76	14.36	5.18	0.003*
Total VIQI score	0.52	0.50	0.73	0.46	0.230
Authorship	0.14	0.35	0.45	0.52	0.085
Attribution	0.07	0.25	0.27	0.46	0.195
Validity	0,03	0.18	0.55	0.52	0.009*
Explanation	0,76	0.87	2.00	1.54	0.027*
Total JAMA score	2,10	0.61	4.00	0.77	0.000*
mGQS	26701,83	85017.91	23417.45	43945.35	0.004*

Abbreviations: VIQI, video information and quality index; JAMA, journal of American Medical Association scale; mGQS, modified global quality scale; SD: standard deviation

* Statistically significant association ($p < 0.05$)

Table 5 shows that there were significant differences relative to the number of views, length of video, VIQI, mGQS, and JAMA score in between content categories ($p < 0.05$). There were statistically significant differences between the low-content and high-content video groups in VIQI-1 ($p < 0.05$), VIQI 2 ($p < 0.05$), VIQI 3 ($p < 0.05$), and VIQI 4 scores ($p < 0.05$).Videos with high content have statistically significantly greater Total VIQI, JAMAS, and mGQS scores than those with low content (respectively p =0.003, p=0,027, p=0,000). When the duration of videos of high-content and low-content was compared, it was discovered that those

with higher content were significantly longer ($p < 0.05$). Compared to the high-content group, the low-content video group had a higher mean number of views (23417,45 ± 43945,35 vs 26701,83 ± 85017,91, $p = 0.004$).

DISCUSSION

A rising number of patients use the internet to understand their current medical condition, seek suitable therapies, and make educated healthcare decisions. The most popular of these websites, YouTube™, receives more than 2 billion views per day. An average of one new video is uploaded every minute, and users spend at least 15 minutes a day on the site. As YouTube™ is accessible from anywhere at any time, it's a popular source of information regarding health-related issues [17]. Also, social media platforms facilitate communication and opinion sharing between patients and their parents. On the other hand, sharing personal experiences has some hazards [14].

The simplicity of uploading content onto platforms like YouTube, coupled with the lack of evaluation of the uploaded material and the sharing of personal experiences, contributes to the spread of misinformation regarding health issues. The authenticity and caliber of the material on this platform, however, have drawn criticism from healthcare professionals. These problems cast doubt on the reliability of this information source and increase the possibility of spreading false information.

Currently, social media is being studied by researchers as a means of disseminating health information. There are many studies evaluating the effectiveness of YouTube™ videos on medical topics such as cancers [9], and vaccination [18] etc.

In dentistry, there are also studies examining the reliability of YouTube™ videos on dental caries[19], regenerative endodontics[20], teeth whitening[21], halitosis[22], cleft lip-palate[23], and orthodontic treatments[24]. In the scope of pediatric dentistry, only several studies evaluating the quality of YouTube videos on stainless steel crowns[14], and space maintainers[25] are available in the literature.

While there are studies examining the reliability of YouTube™ videos on other dental topics, there are no studies evaluating the reliability and quality of videos on silver diamine fluoride in pediatric dentistry. Therefore, our study aimed to examine the quality and reliability of YouTubeTM videos about silver diamine fluoride in pediatric dentistry and fill the gap in the literature. In many countries, silver diamine fluoride is used to slow down the formation of caries when traditional treatments are not appliable. Silver diamine fluoride is used in different concentrations to stop the development of dental caries, to provide remineralization and to prevent caries from reaching the pulp. Silver diamine fluoride has become popular again, especially during the pandemic period when minimum aerosol production is important. Silver diamine fluoride treatment is indicate in high caries-risk patients with anterior or posterior active cavitated lesions, untreated early childhood caries, uncooperated and special care needed pediatric patients [3].

In our study, 69 YouTube™ videos on silver diamine fluoride were screened and 29 (42,02%) of them were excluded from the study. The exclusion rate for the research on the quality of dental trauma YouTube™ videos was 66,7% [26], while it was 70% on the oral hygiene quality of children [27]. Both rates are more than the rates of our study. These high rates prove that patients, their relatives and physicians have struggled to access information due to unnecessary videos, even if they type the correct search terms. When we evaluated the content quality of the videos by using the guidelines prepared by American Association of Pediatric Dentistry on the using silver diamine fluoride [3] and combining them with our clinical observations, the results were unsatisfactory with an average of 5.03±2.84 out of 13.

In a study evaluating YouTube™ videos on oral leukoplakia, it was found that videos with high content received statistically significantly more likes than those with low content ($p < 0.05$)[28]. In contrast to these findings, in our study, no significant difference was found in the number of likes for high (164,45 ± 275,65) and low (110,97 ± 263,70) content videos ($p>0.05$).

In the study evaluating the quality of YouTube™ videos about removable orthodontic appliances, the VIQI-2 and VIQI-4 values of high content videos were statistically higher than low content [29], similar to our

study. A study evaluating the reliability of YouTube™ videos on lingual orthodontic treatments showed that VIQI values did not show any statistical difference according to the high and low content videos [24], which is in contrast to our study. In a study evaluating YouTube™ videos with the JAMA values on root canal treatment were as 2,54 ± 0,81, on endodontic treatments were as 2,76 ± 0,74 [13], while they were much lower in our study at 1,10 ±1,21. In accordance with our study, it was determined that mGQS values were statistically significantly higher in high content videos than in low content videos in a study examining the quality of YouTube™ videos about orthodontic clear aligners [11] and in this respect, it was similar to our study. When YouTube™ videos containing information about oral self-examination to detect oral cancers were evaluated by mGQS in terms of quality, the average value was 3,71 ± 1,30 [30], which is much higher than revealed in our study; 2,63 ± 1,07.

Quantitative evaluations were made in the study by using indexes such as JAMA, VIQI and mGQS, and it was determined that the values obtained from these indexes were statistically significantly lower in low-content videos than in high-content videos (respectively p=0,027, p=0,003 and p=0,000.) This shows that the data obtained from the indexes correspond to the grouping of the videos in terms of content quality.

Silver diamine fluoride applications are usually recommended by the dentist to the parents of a non-cooperated child patient as an alternative to dental caries treatments. It is very limited for the patient and his/her guardian to contact the dentist with a request for silver diamine fluoride application. For this reason, dentists or healthcare professionals are the first point of contact for information about silver diamine fluoride for patients and their parents. Patients and their relatives may need to learn more about this treatment method that they have heard for the first time and may use social media as a source of information. At this point, especially YouTube™ videos are one of the first preferred sources of information because of their easy accessibility.

It was noticed that in the low-content silver diamine fluoride YouTube videos, only general information was given and addressing simple usage. Additionally, spotted that in high quality videos, unlike low quality videos, the mechanism of silver diamine fluoride, factors of consideration, cost information and restoration options were stated. Also in low content videos while the advantages of silver diamine fluoride were mentioned, the disadvantages were not sufficiently mentioned and mostly the patients' own experiences were shared.

One of the most important disadvantages of silver diamine fluoride applications is that it causes permanent black stains on dental tissues. Studies have even revealed that these black stains are the main reason that negatively affects the treatment acceptance of the patient's parents. Black staining of the carious lesion can have adverse impacts on patients and parents, particularly when applied to anterior teeth where aesthetics are critical [3]. Therefore, early notification to the patient and their family members will impact the patient's happiness after therapy. Therefore, we believe that possible black staining should be mentioned in YouTube videos about silver diamine fluoride.

As a result of this study, it can be concluded that the quality of YouTube videos on silver diamine fluoride is inadequate. It can be recommended that universities and international associations should take responsibility for the easy access of patients and their parents to correct information. It would be beneficial for international associations in the field of pediatric dentistry, which provide the development of current guidelines on silver diamine fluoride applications, to produce high quality content videos that informs both the dentist and the patient's parents on their social media platforms and YouTube channels. Thus, dentists can direct patients' relatives who want to learn more about silver diamine fluoride to the contents of these organizations and provide them access to reliable information.

CONCLUSIONS

The content of YouTube™ videos produced for silver diamine fluoride was generally inadequate. Most of the videos covered the procedures and basics of use, with only a few addressing usage, factors to consider, mechanism of silver diamine fluoride, cost information, restoration options and side effects. International associations and universities may have to take a responsibility for the production and increase in high-quality videos about silver diamine fluoride according to up to date guidelines. Families with prejudices against the use of fluoride-containing dental preparations may be further discouraged by misinformation-filled and low-quality videos. International organizations should take responsibility for providing access to accurate information about silver diamine fluoride and support appropriate health communication channels.

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Not applicable.

CONFLICT OF INTERESTS

No conflicts of interest present.

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