

Assessing the information quality of YouTube™ videos on the effects of smoking on oral health: a cross-sectional study

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ABSTRACT

Aims: To evaluate the content on the effects of smoking on oral health.

Methods: YouTube™ was searched for videos on 16 May 2023 using the keyword “smoking and oral health,” and “sort by relevance” was preferred as the filter. 102 video content was scored based on the DISCERN instrument, the criteria established by the Journal of the American Medical Association (JAMA) and the Global Quality Score (GQS). The data were analyzed using analysis of variance, the Kruskal-Wallis test, and the Spearman's rho test.

Results: The mean DISCERN, JAMA, and GQS scores of all 102 videos are 2.71 (SD 1.10), 1.56 (SD 0.87), and 3.13 (SD 1.26), respectively. A strong positive correlation was detected between DISCERN and GQS ($r=0.894$, $p<0.001$), JAMA and GQS ($r=0.709$, $p<0.001$), While the number of views strongly positively correlated with the viewing rate and likes ($r=0.840$, $p<0.001$; $r=0.849$, $p<0.001$, respectively).

Conclusion: YouTube videos on smoking and oral health were limited in number and had poor quality. Dentists/specialists should upload videos containing comprehensive information regarding the detrimental effects of smoking on oral health and smoking cessation.

Keywords: YouTube™, internet, tobacco, smoking, oral health

INTRODUCTION

Smoking is one of the most important causes of preventable deaths worldwide. One billion people will die due to its harmful effects has been estimated by the 21st century.¹ It is also detrimental to oral health and generally accepted as the major preventable risk factor in the incidence and progression of periodontal disease.²⁻⁵ Non-smoking individuals exposed to environmental tobacco smoke are also prone to oral and systemic diseases.^{4,6,7} A new category of nicotine products emerged between 2006 and 2009, electronic cigarettes or e-cigarettes. About 40 million users of e-cigarettes worldwide.⁸ E-cigarettes' potential risks and benefits have been extensively debated in many disciplines and are still controversial.^{9,10}

The internet has revolutionized the way accessing and sharing information; with the advent of new technological applications, has emerged as a powerful platform for effectively communicating and disseminating further health-related information to patients. This convenient and easily accessible medium has empowered people to actively manage their health by providing various resources, ranging from reputable medical websites to online forums and interactive tools. YouTube™ is a widely recognized online video platform launched in 2005 and has grown into a global phenomenon, attracting billions of users who watch videos on a wide range

of topics. Seeking knowledge about health-related issues, treatment options, and patient experience, YouTube™ offers endless content that caters to every interest and curiosity. Easy accessibility and cost-free availability are definite advantages, allowing individuals to explore various health topics and gain preliminary knowledge.¹¹ Compared to professionally curated medical resources, YouTube™ needs a comprehensive screening process for the content published on its platform. Initial filtering can lead to a significant disadvantage as the reliability and adequacy of the information provided in health videos may vary significantly. Viewers must exercise discernment and critical thinking skills to differentiate between evidence-based, trustworthy sources and those that may offer incomplete or misleading information. It is crucial to share qualified healthcare professionals or trusted sources to ensure accurate and reliable health-related videos should obtain.

Several studies evaluated YouTube videos about smoking.¹²⁻¹⁵ However, as far as we know, research has yet to be conducted on YouTube™ videos as a source of information on smoking and oral health. This study aimed to analyze and determine the sources of uploads, the nature of the content, and the availability of relevant information in videos related to

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smoking and oral health on the YouTube™ platform and to assess the quality of information provided in these videos using quantitative scoring with adapted DISCERN score, Journal of American Medical Association (JAMA) benchmark criteria, and Global Quality Score (GQS). By utilizing these scoring tools, the study sought to evaluate the reliability and accuracy of the information presented in YouTube smoking and oral health videos.

METHODS

No clinical data, human participants, or laboratory animals were utilized in this research. All the information in this study was sourced exclusively from publicly available YouTube videos, and no data accessed compromised personal privacy. Furthermore, this study did not involve direct user engagement, making an ethics review unnecessary. All procedures were carried out in accordance with the ethical rules and the principles.

To account for algorithm-based variability and personalization that may influence search rankings, a standardized search was conducted on May 16, 2023. The search was performed on the online video-sharing site YouTube (<https://www.YouTube.com>) using the keyword ‘smoking and oral health’ with the ‘sort by relevance’ filter to capture a representative snapshot of the content most likely to be encountered by a general user. As search results may vary on different days, the initial 250 video links were stored. 102 videos were also evaluated by two observers (DDS, Ph.D.) who are experts in endodontics and have at least five years of clinical experience. Among all, 148 videos were excluded with no audio or visual, longer than 30 minutes, were not in English, were duplicated, and were irrelevant to the topic term. Two observers further analyzed the remaining 102 videos that met the inclusion criteria (Figure).

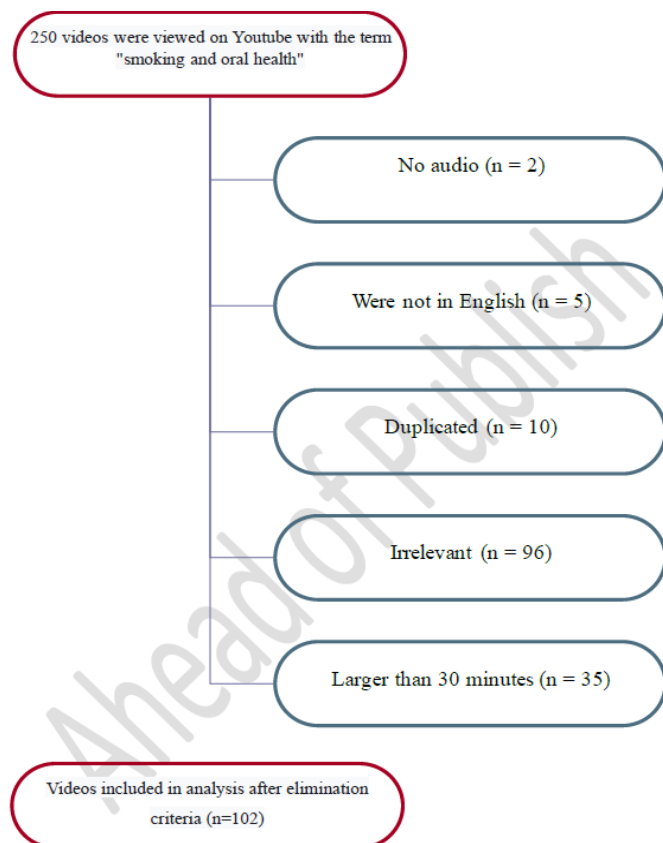


Figure. Flowchart of search strategy

Following the evaluation of the videos, the demographic features were documented, such as duration in seconds, upload time, the number of views, days since upload, and number of likes. The viewing rate was determined by the ratio of the number of views to the number of days since upload $\times 100\%$.

The uploaders were categorized as the source who prepared the videos into four categories dentist/specialist, hospital/dental clinic, dental hygienist, and other (layperson or an unclear source).

In assessing the quality of the selected YouTube™ videos, we employed the DISCERN instrument, the criteria established by the JAMA and the GQS. These widely recognized instruments are common standards for evaluating health information, ensuring a comprehensive quality assessment of the videos.

The DISCERN, originally designed to assist patients, general consumers, and caregivers in discerning the reliability of online information, has been adapted by Kılınc and Sayar¹⁶ to create a modified version. This modified tool utilizes a five-point scale to assess accuracy and reliability. A total modified DISCERN score ranging from 0 to 25 is calculated by evaluating five specific questions as shown in the Table 1. The resulting score is then used to determine the level of reliability, categorized as poor, generally poor, moderate, good, or excellent. This modified DISCERN tool provides a systematic approach for evaluating the credibility and trustworthiness of web-based information, empowering individuals to make informed decisions about the reliability of online content.

Table 1. Modified DISCERN

1.	Is the aim clear concise, understandable?
2.	Are sources of information reliable? (cited publication video content were from valid studies, dentists endodontists)
3.	Is the information presented balanced and unbiased? (any reference to other treatment choices)
4.	Are additional sources of information listed?
5.	Does the video address areas of uncertainty?

The JAMA benchmark criteria, as proposed by Silberg et al.,¹⁷ utilize a scoring system ranging from 0 to 4. This scale comprises four individual criteria, with one point assigned for the presence of each item. Table 2 shows the JAMA scale offers a nonspecific evaluation of source quality. A total score of 4 signifies a high-quality source, while a score of zero suggests poor quality.

Table 2. JAMA benchmark criteria

Authorship	Authors partnerships and contributors, their affiliations and relevant credentials should be provided
Attribution	References and resources used for the content and a copyright statement should be listed clearly
Disclosure	Dates when content was posted and updated should be indicated
Currency	Sponsorship, advertising commercial financing potential conflicts of interest should be prominently and fully disclosed

JAMA: Journal of the American Medical Association



The 5-point GQS Index was scored according to the flow, quality, and educational usefulness in a range between 1 (poor quality) to 5 (excellent quality), as explained in **Table 3**.¹⁸

Scores	
1	Poor quality poor flow, most information missing, not useful for education
2	Generally poor quality and flow of limited use to patients because only some information is present but many important topics missing
3	Moderate quality, suboptimal flow, somewhat useful for patients as some important information is adequately discussed but others poorly discussed
4	Good quality generally good flow useful to patients because most relevant information is covered but some topics not covered
5	Excellent quality and flow, highly useful to patients

Statistical Analysis

Shapiro-Wilks test was used to evaluate the distributions in the descriptive analysis of the data. Cohen's kappa analysis was used to assess inter-observer agreement. The resulting coefficients were interpreted as follows: 0.00-0.20: insignificant; 0.21-0.40: weak; 0.41-0.60: moderate; 0.61-0.80: significant; 0.81-1.00: almost perfect. Nonparametric data across different groups were compared using the Kruskal-Wallis test. The Spearman's rho test was used to evaluate the relationship between the quantitative variables. $p < 0.05$ was accepted to indicate statistical significance.

RESULTS

Video duration, likes, views, viewing rate, and number of days elapsed since upload date were analyzed and presented in **Table 4**.

According to video sources, 47.05% (48/102) of the videos were posted by dentists/specialists. The proportion of the rest of the sources were hospitals/dental clinics 26.47% (27/102), other 18.62% (19/100), and dental hygienists 7.84% (8/102), respectively.

Agreement between different scores given by two experts on 102 videos was evaluated; Modified DISCERN ($\kappa:0.895$, $p < 0.01$) and GQS ($\kappa:0.899$, $p < 0.01$) scores showed near perfect agreement, while the JAMA ($\kappa:1.000$, $p < 0.01$) score showed perfect agreement. Due to the high degree of inter-rater agreement, a single common score was determined for the different scores, and the study continued based on this commonly agreed score.

Table 5 presents data on all videos and videos grouped by sharing source, including information from DISCERN, JAMA, and GQS. There was no statistically significant difference in DISCERN, JAMA, and GQS between the uploaders of dentist/specialist and hospital/dental clinics ($p > 0.05$). However, these values were significantly different from the uploader of the others and dental hygienists ($p = 0.001$). No statistically significant difference was detected for DISCERN, JAMA, and GQS between dental hygienists and the other uploaders ($p > 0.05$).

Sources	GQS	Modified DISCERN	JAMA
All sources	3.13±1.26	2.71±1.10	1.56±0.87
Dentist/specialist	3.38±1.12	2.85±0.92	1.71±0.62
Hospital/dental clinic	3.63±1.24	3.15±1.23	1.59±0.57
Dental hygienist	1.63±0.74	1.00±0	0.75±0.71
Other	1.42±0.51	1.05±0.40	0.47±0.51

GQS: Global Quality Score, JAMA: Journal of the American Medical Association

A strong positive correlation was detected between DISCERN and GQS ($r = 0.894$, $p < 0.001$), JAMA and GQS ($r = 0.709$, $p < 0.001$). While the number of views strongly positively correlated with the viewing rate and likes ($r = 0.840$, $p < 0.001$; $r = 0.849$, $p < 0.001$, respectively), it moderately positively correlated with the number of days since upload ($r = 0.442$, $p = 0.001$). **Table 6** shows the relationship level between video variables. The relationship level between video variables.

Duration (secs)	Like	View	Viewing rate	Days since upload
200.31±198.18 (range 12 to 896)	5.304.38±42.640.88 (range 0 to 419.000)	216.354.60±1.701.666 (range 2 to 17.070.411)	21.559.67±138.534.30 (range 0.56 to 1.185.445.21)	1.515.476±1.421.227 (range 2 to 5040)

	Like	Day since upload	View	Viewing rate	Duration (secs)	GQS	Modified DISCERN	JAMA
Like	-	$r = 0.265$ $p = 0.007$	$r = 0.840$ $p < 0.001$	$r = 0.779$ $p < 0.001$	-	-	-	-
Day since upload	$r = 0.265$ $p = 0.007$	-	$r = 0.442$ $p < 0.001$	-	-	-	-	-
View	$r = 0.840$ $p < 0.001$	$r = 0.442$ $p < 0.001$	-	$r = 0.849$ $p < 0.001$	-	-	-	-
Viewing rate	$r = 0.690$ $p < 0.001$	-	$r = 0.849$ $p < 0.001$	-	-	-	-	-
Duration (secs)	-	-	-	-	-	$r = 0.376$ $p < 0.001$	$r = 0.411$ $p < 0.001$	$r = 0.206$ $p = 0.038$
GQS	-	-	-	-	$r = 0.376$ $p < 0.001$	-	$r = 0.894$ $p < 0.001$	$r = 0.709$ $p < 0.001$
Modified DISCERN	-	-	-	-	$r = 0.411$ $p < 0.001$	$r = 0.894$ $p < 0.001$	-	$r = 0.662$ $p < 0.001$
JAMA	-	-	-	-	$r = 0.206$ $p = 0.038$	$r = 0.709$ $p < 0.001$	$r = 0.662$ $p < 0.001$	-

[†]Spearman correlation coefficient. No significant results found. GQS: Global Quality Score, JAMA: Journal of the American Medical Association



The majority of the videos were often focused on many contents of adverse effects of smoking, such as gum disease (n=63), oral cancer (n=63), stain (n=43), healing after surgery (n=34), terrible smell (n=35), lung cancer (n=13), implant surgery (n=13), immune response (n=11), diminished taste (n=10), cardiovascular disease (n=9), hairy tongue (n=7), anxiety (n=5) and leukoplakia (n=4). Half the videos included smoking cessation advice, while twelve gave smokers oral hygiene tips.

The videos shared not only the harmful effects of smoking cigarettes but also e-cigarettes (n=21), smokeless tobacco (n=11), pipes (n=3), and hookahs (n=2).

DISCUSSION

In the era of digitalization, when we have inquiries or need information, websites like Google and YouTube have become our primary go-to sources. Internet platforms shape our daily routines and are critical in essential matters. Internet and video-sharing media such as YouTube™ have gained immense popularity among individuals searching for health-related information and medical procedures. However, it is concerning that the information and videos uploaded to these platforms often need more scientific filtering, leading to potential misinformation and incomplete understanding for the viewers, especially patients. Despite concerns regarding the reliability and quality of such information, patients may likely continue to rely on YouTube™ as a prominent online resource. Therefore, professionals must conduct further research, considering the increased Internet use for health-related issues. To our awareness, this study represents one of the initial attempts to specifically evaluate YouTube™ videos regarding the effects of smoking on oral health, a niche that has remained relatively unexplored despite the abundance of general dental literature on the platform.^{12,13,15,19-30} The aim of this study was to examine the quality and content of the videos about the impact of smoking on oral health and to shed light on its potential effects on individuals.

In the analysis studies on YouTube™, Instagram, and other internet platforms focusing on dental and medical issues in the literature, different results were reported regarding the quality evaluations of the videos. While some researchers report that the content quality of the posts was sufficient, others identified them as incomplete and inadequate. These disparities may arise from variations in the analyzed topics, evaluation criteria, and the diversity among video uploaders.

There are various filters available to sort the videos based on “view count,” “upload date,” and “video duration.” In this study, the default filter “sort by relevance” was used for YouTube™ search, as it is the most commonly preferred option by users and research studies.

Smoking is a critical lifestyle factor with systemic effects on human health. Long-term exposure to cigarette smoke triggers pathophysiological processes such as systemic oxidative stress, chronic inflammation, and vascular endothelial dysfunction. This increases the incidence of systemic diseases such as atherosclerosis, chronic obstructive pulmonary disease, and coagulation disorders, and also negatively affects the prognosis of existing diseases.³¹ Although our search term was “smoking and oral health,” some videos mentioned that smoking contributes to lung cancer, cardiovascular disease, osteoporosis, anxiety, dementia, diabetes, and *Candida*.

The mouth is the only body part where the effects of smoking are visible, and unfortunately, it is often neglected by smokers. Most of the videos mentioned that smoking had been linked to various oral health problems, including more severe gum disease (periodontitis), increased tooth loss, gum recession, loose teeth, and more significant bone loss in the jaw. Smoking weakens the immune system and reduces blood flow to the gums, making it harder for the body to neutralize pathogens and heal damaged tissues.³² This can lead to a higher risk of developing gum disease and susceptibility to more severe periodontal tissue disease. In the videos reviewed in this study, periodontologists shared more detailed content stating that smoking increases periodontal tissue destruction.

Electronic cigarettes, commonly known as e-cigarettes, have gained significant global popularity, mainly due to the widespread accessibility provided by the Internet.³³ Batteries power these devices by vaporizing a solution containing nicotine, flavors, and various chemicals. The advent of e-cigarettes has introduced a new option for nicotine consumption, attracting a substantial user base worldwide. Nicotine consumption, the puff duration of e-cigarettes, is typically longer and requires more potent suction than conventional cigarettes. This difference arises from the unique mechanism of e-cigarettes, where users inhale and activate the device through a more forceful suction. The prolonged puff duration and increased suction intensity contribute to nicotine delivery in e-cigarettes, potentially affecting user behavior and nicotine intake patterns. In the study focusing on YouTube™ videos, Merianos et al.³⁴ reported the results related to how e-cigarettes can assist individuals in quitting smoking, the purported health benefits of e-cigarettes compared to traditional cigarettes, and the absence of smoke or second-hand smoke exposure associated with e-cigarette use. This result can be attributed to the fact that 53.1% (n=55/34) of the videos reviewed by the researchers were advertising/marketing and personal/testimonial uploaders. Contrary to the study, the videos in this study indicated that e-cigarettes have similar, or even worse, harmful effects on oral health compared to conventional cigarettes. This result may be attributed to the majority of uploaders being dentists/specialists 4.05% (48/102) or hospitals/dental clinics 26.47% (27/102). The use of e-cigarettes may lead to higher levels of nicotine addiction, potentially increasing the likelihood of quitting to cigarette smoking.^{35,36}

Smoking reduces blood circulation in the mouth, facilitating the formation and progression of oral cancers.³⁷ In videos shared by specialists, it is stated that approximately 90% of those with mouth and throat cancer use tobacco or have used it for a while. Garg et al.²⁰ have highlighted that healthcare professionals, academic institutions, and professional organizations could enhance the quality of oral cancer-related content on YouTube™ by sharing informative videos and guiding patients toward trustworthy sources of information in India. In line with the findings of this study, the videos shared by periodontologists and surgeons regarding the effects of smoking on oral health included pre-cancerous lesions such as leukoplakia and hairy tongue, emphasizing the importance of early diagnosis. The videos shared by the professionals examined in this study stated that individuals who start smoking before the age of 16 have a higher risk of developing oral cancer and that the combination of smoking and alcohol is responsible for 90% of oral cancers. The lack of



references for these statements may explain the low DISCERN and JAMA scores.

Smoking is known to have adverse effects on oral health, including an increased risk of implant failure and complications.³⁸ Smoking may affect the success rate of dental implants by impairing osseointegration and reducing the body's ability to limit and attenuate disease progression infections.³⁹ It may also lead to reduced bone density, which is essential for implant stability and integration. In line with the study of Bulut et al.⁴⁰ examining YouTube™ and peri-implantitis, the present research similarly revealed that the uploaders of the analyzed videos emphasized the role of smoking as a significant risk factor for peri-implantitis.

An examination of video viewership patterns reveals that videos with a duration of less than 3 minutes tend to attract significant attention from viewers, as in a previous study.⁴¹ However, it should be noted that these videos often suffer from poorer video quality. Moreover, the YouTube™ platform offers duration filters that enable users to refine their search based on video length. Notably, in scientific settings, there may be a clear correlation between the duration of a video and the attention of the viewers, with an evident decline as the video length increases. This underscores the critical importance of creating concise and focused video content to maximize viewer engagement. This study revealed that individuals are more interested in lasting 4-5 minutes of videos.

Owing to the functioning of the YouTube™ algorithm, social media content creators can make alterations to their videos and modify comments and associated data. Such modifications can lead to variations in search results during different periods. It is important to note that the evaluation for this study involved a search conducted on 16 May 2023; thus, the outcomes may differ subsequently. The calculation of interaction index and dislike data was not feasible due to YouTube's decision to remove the visibility of dislike counts for videos.

Grönholm et al.⁴² indicated a need for increased awareness and education regarding local smoking cessation treatment guidelines and effective cessation interventions within dental practice, aiming to address the existing obstacles and enhance the promotion of successful smoking cessation efforts. Although there were videos emphasizing the necessity of smoking cessation for oral health in this study, Richardson et al.¹² and Grönholm et al., found that there was limited focus on delivering a comprehensive explanation. Videos explaining the adverse effects of smoking on oral health should provide viewers with accurate and up-to-date information to help them learn proper oral care practices and maintain oral health. Furthermore, in videos uploaded by dentists/professionals, greater emphasis should be aimed on increasing oral health awareness among viewers and highlighting the importance of quitting smoking with more scientific content.

Limitations

The limitation of this study conducted on YouTube is that the platform's search algorithm filters results based on user history, location, and its current ranking criteria (relevance, view count, engagement). This can lead to different results being listed for searches performed at different times or on different devices using the same keywords. This can create difficulties in conducting comprehensive and consistent

analyses. The research was limited to English keywords only. This resulted in the exclusion of high-quality scientific content or diverse clinical approaches produced in other languages (Turkish, Spanish, Chinese, etc.) from the analysis.

CONCLUSION

As social media platforms continue to play an increasingly significant role in society, it may become paramount to establish quality-control mechanisms to ensure information accuracy and reliability, particularly in health-related content on platforms like YouTube™. As a result, the quality of smoking and oral health-related videos needs to be improved. In particular, there is a need for comprehensive scientific videos prepared by specialists.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study did not require ethical approval as it did not involve any human subjects or animal experiments.

Informed Consent

Because the study has no study with human participants, no written informed consent form was obtained.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

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Author Contributions

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