Araştırma Makalesi – Original Article

Evaluation of YouTube™ Videos Regarding ICON as an Information Resource: A Cross-Sectional Study*

ICON Hakkında Bilgi Kaynağı Olarak YouTube™ Videolarının Değerlendirilmesi: Kesitsel Bir Çalışma

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ÖZ

Amaç: Bu çalışmanın amacı, YouTube™ platformundaki ICON ve reçine infiltrasyon tekniğiyle ilgili videoların bilgilendirici içeriğini değerlendirmektir.

Yöntem: YouTube™'da 'resin infiltration technique' ve 'ICON' anahtar kelimeleri kullanılarak arama yapıldı. YouTube™ sonuçları "ilgililiğe göre" filtrelendi ve her iki anahtar kelime için ilk 100 video değerlendirildi. Dahil etme/dışlama kriterlerine göre 103 video analiz edildi. Videoların parametreleri (izlenme sayısı, beğeni sayısı, beğenmeme sayısı, yorum sayısı, yüklenme süresi, video süresi, etkileşim indeksi (II) ve video güç indeksi (VPI)) kaydedildi. Güvenilirlik, doğruluk ve içerik kalitesi; modifiye DISCERN Anketi, Amerikan Tıp Derneği (JAMA) kriterleri ve Küresel Kalite Ölçeği (GQS) kullanılarak değerlendirildi. İstatistiksel analizde Kruskal Wallis testi, Dunnett'in Post Hoc testi ve Spearman korelasyon katsayıları kullanıldı. Anlamlılık düzeyi 0.05 olarak belirlendi.

Bulgular: YouTube™'da ICON ile ilgili videolar analiz edildiğinde, video yükleyicisinin kaynağına göre yapılan değerlendirmede yalnızca JAMA kriterlerinde anlamlı bir fark bulundu ($p<0.01$). JAMA-GQS, JAMA-m-DISCERN ve GQS-m-DISCERN arasında pozitif korelasyon tespit edildi (sırasıyla $r= 0.215$, $r= 0.32$, $r= 0.481$).

Sonuç: YouTube™ videoları, beyaz nokta lezyonları veya florozis olan hastalara minimal invaziv bir tedavi seçeneği hakkında bilgi vermede faydalı olabilir. Ancak, kesin tanı ve tedavi için uzmanlara danışmak hayati önem taşımaktadır.

Anahtar Kelimeler: GQS, ICON, JAMA, modifiye DISCERN, rezin infiltrasyon tekniği, YouTube™

ABSTRACT

Objective: The aim of this study is to evaluate the informational content of YouTube™ videos related to ICON and the resin infiltration technique.

Method: 'Resin infiltration technique' and 'ICON' was searched as a keyword on YouTube™. YouTube™ was filtered by the relevance, and the first 100 videos for each two keywords were evaluated. After the inclusion/exclusion criteria 103 the video was analyzed. Parameters of the videos (the number of views, likes, dislikes, comments, the days since the upload, the duration of the video, interaction index (II), and video power index (VPI)) were recorded. Reliability, accuracy, and content quality were evaluated by the modified-DISCERN Questionnaire, the Journal of American Medical Association (JAMA) benchmark, Global Quality Scale (GQS). The Kruskal Wallis test, the Dunnett's Post Hoc and Spearman correlation coefficients were used for statistical analysis. The significance levels were set at 0.05.

Results: When the YouTube™ videos related to ICON were analyzed, according to video uploader sources assessment there was a significance different only in the JAMA criteria ($p<0.01$). A positive correlation was detected among JAMA-GQS, JAMA-m-DISCERN, and GQS-m-DISCERN scores ($r= 0.215$, $r= 0.32$, $r= 0.481$, respectively).

Conclusion: YouTube™ videos are useful for informing patients with white spot lesions or fluorosis that a minimal invasive treatment option is available. However, it is essential to consult professionals for definitive diagnosis and treatment.

Keywords: GQS, ICON, JAMA, modified DISCERN, resin infiltration technique, YouTube™

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Introduction

Dental fluorosis is a chronic, fluoride-induced disorder characterized by impaired enamel development and hypomineralization, resulting from the excessive incorporation of fluoride into the enamel of developing teeth.[1,2] The most significant determinant of fluorosis occurrence and severity is the total intake of fluoride from all sources during the critical period of tooth development.[2] Fluorosis exhibits a distinctive appearance with respect to the surface of the teeth and their distribution within the mouth.[1-3]

Dental caries is a pervasive, long-term condition that affects individuals of all ages and social strata.[4] It is a prevalent issue that has become a major public health concern globally.[4] White Spot Lesions (WSL) represent the initial stage of dental caries development, characterized by sub-surface demineralization beneath an intact enamel surface.[5] These lesions are considered to be the first sign of the disease.[5] The enamel in the affected region exhibits reduced mineral content, which consequently impairs its optical characteristics, causing the enamel to appear more opaque.[6] This occurs because less/no light is able to reach the dentin in these areas as compared to the adjacent, intact enamel.[6] As demineralization levels increase, the amount of scattered light also increases, resulting in a threefold increase in power.[7] Consequently, the opacity intensity of the clinical appearance of WSL has been altered.[7]

The refractive index (RI) of hydroxyapatite (HAp) is 1.6 and that of air is 1.[8] Since almost all (96%) of a healthy enamel is composed of HAp, it exhibits a homogeneous structure.[9] Intact enamel transmits most of the light to the dentin, allowing the dentin color to be reflected.[9] In fluorosis teeth and WSL, light is scattered many times on the surface due to the presence of both mineral and organic content.[9] While remineralizing agents such as fluoride and casein phosphopeptide–amorphous calcium phosphate (CPP-ACP) are effective in the initial stages of enamel demineralization, their efficacy decreases in more advanced lesions due to their limited penetration depth.[10] Depending on the severity of WSL and fluorosis, treatment options may include micro- or macroabrasion, bleaching, resin infiltration, composite restorations, veneers, or crowns.[10] Because it is a minimally invasive technique that involves the removal of only a small amount of enamel, the resin infiltration approach yields favorable outcomes in the management of both advanced WSL and fluorosis.[11]

The main aim of resin infiltration technique is to both stop the incipient caries lesions and strengthen the enamel matrix by closing the micro pores that cause diffusion pathways for acids and dissolved minerals with resin.[12] ICON® (DMG, Hamburg, Germany), which stands for "Infiltration concept," is the brand name for a relatively new resin infiltration product that comes in kits for the proximal and vestibular surfaces.[13] The ICON product consists of a 15% hydrochloric acid (HCl) etchant (ICON® Etch) which exposes the rough structure of the hypomineralized lesion, ethanol (ICON® Dry) which removes the water under the body of the lesion, and resin infiltrant (ICON® Infiltrant) which enables the penetration of triethylene glycol dimethacrylate (TEGDMA) resin monomers into the body of the lesion.[13]

YouTube™, the second largest platform after Google, was founded in 2005 in the United States and has since become a global phenomenon that can be accessed from anywhere in the world.[14] As a leading platform for video sharing, it has revolutionized the way people consume media and has become an essential part of modern communication.[14] On YouTube™, all users are afforded the opportunity to view and upload videos, engage in commentary, and even establish their own YouTube™ channel account.[15] The lack of subject limitation causes YouTube™ to be used as a resource by people on any subject.[15] For this reason, especially in videos with health content, the professionalism / quality of the video uploader, the accuracy, reliability, and quality of content of the videos become very important.[15] Otherwise, viewers may receive misleading or incorrect information, which could lead to misunderstandings about health-related topics.

In this digital age, the internet has made it extremely convenient to access information, but this has also led to the problem of information pollution.[16] On constantly evolving platforms like YouTube™, it is particularly challenging to maintain accuracy and clarity.[14] As there is currently no mechanism in place to regulate the content uploaded on YouTube™, it is essential to carefully evaluate videos for their reliability, accuracy, and overall quality.[17] This ensures that patients are not misled and can make informed decisions about their dental care.[17] Several investigations have been conducted to assess the accuracy, relaibility, and quality value of YouTube™ content on various topics.[17,18] However, it is noteworthy that no studies have yet focused specifically on the subjects of "resin infiltration technique" and "ICON," despite their relevance to dental patients. This research is particularly important as it represents the first study of its kind in the literature to ensure that individuals receive accurate, reliable and high-quality information regarding the resin infiltration technique and ICON, a minimally invasive approach to conditions such as fluorosis and WSL.

The null hypotheses were as follows:

■ There would be no significant differences among the video demographic variables, the JAMA, GQS, and m-DISCERN scores.

■ There would be no significant differences between the video demographic variables and the content source scores.

■ There would be no significant correlations among the JAMA, GQS, and m-DISCERN scores.

Material and Methods

The current study is a cross-sectional investigation that employs both qualitative and quantitative analyses of video content accessible on YouTube™, a platform owned by Alphabet Inc. (Mountain View, CA, USA), focusing on the subject of resin infiltration technique and ICON. As the data for this study were obtained from publicly accessible YouTube™ videos, it was not required for this project to obtain approval from an ethics committee.[15]

YouTube™ Search Strategy

The process of screening eligible videos was carried out within a time frame of two days, taking into consideration the significant volume of videos that are generated and uploaded on a daily basis, as well as the rapidly evolving nature of social media. An investigation was conducted by a solitary researcher (AYS) with the employment of the keywords "ICON and resin infiltration technique" on the YouTube™ search engine (https://www.youtube.com/) on February 28, 2024. For the analyzing and evaluating the videos, the researchers dedicated approximately one and a half week. The investigation was conducted by establishing a new, unused YouTube™ account. This approach was taken because the YouTube™ algorithm takes into account user interactions when recommending content.[19] To commence the evaluation process, the initial 100 videos for each keyword were meticulously assessed.

Exclusion and Inclusion Criteria

The following criteria were applied to exclude videos from the analysis: 1) videos utilizing a language other than English 2) duplicate videos 3) videos lacking both audio and visual content 4) videos not directly relevant to ICON and resin infiltration technique 5) videos longer than 15 minutes in duration 6) YouTube™ shorts. These criteria were strictly adhered in order to ensure a thorough and accurate analysis of the available videos. The selection criteria for the videos consisted of teaching materials and/or technical procedures uploaded in English on YouTube™ pertaining to ICON. To assess the target audience of each video, the researchers evaluated the speech and technical language used. Additionally, videos that documented the procedures performed on patients were considered.

Related Video Assessment

The evaluation of videos was conducted through an assessment of various parameters, including the number of views, likes, dislikes, comments, video duration, days since upload, viewing rate, interaction index, and video power index. The video uploaders were categorized into five groups: dentist/specialist, dental company, dental clinic, YouTube™ channel, and other. The videos were assessed under four headings based on their content: educational, advertisement, patient's pleasure, and other.

In the preliminary examination, multiple factors of video analysis were considered, such as the video's duration, the number of days since its upload, the total number of views, likes, and dislikes, and the number of comments. Using these factors, various metrics were calculated, including VPI, viewing rate, and II, which are measures of video popularity. The formula used to calculate the VPI, viewing rate, II are:[20,21]

VPI: [like rate * view rate / 100]. The rate of likes is calculated with the formulas [likes * 100 / (likes + dislikes)] and views (number of views/days)

Viewing Rate (%) = (number of views/ number of days since upload) × 100

II (%) = [(number of likes − number of dislikes)/(total number of views)] × 100.

Assessment Scales (Modified DISCERN, GQS, JAMA)

The assessment of the 200 videos was carried out by employing various scales to evaluate their capacity to offer valuable information to viewers, as well as their dependability and accuracy. The scales utilized were the Global Quality Score (GQS), the Journal of the American Medical Association (JAMA) Benchmark Criteria, and the Modified DISCERN Questionnaire. The evaluation of the videos' ability to provide sufficient information on ICON was based on their performance in relation to these criteria.

The GQS was used to assess the content and structure of the videos. The GQS rates the quality of the videos on a scale of 1 to 5, with 1 indicating low quality and 5 signifying high quality.[22] The evaluation focused on the overall quality of the videos, including their coherence, flow, and the accuracy of the information they conveyed. The content quality scale is used to evaluate the level of information accessibility and flow on websites, with a range of one to two indicating low content quality, three indicating intermediate content quality, and four to five indicating high content quality. To improve the content quality score of a website, it is important to ensure that the information provided is clear, concise, and easy to understand.[23] As evident from the graph depicted in ***Figure 1***, a higher score on this scale signifies a superior quality of information.

Table 1. Global Quality Score (GQS) scoring system, The Journal of American Medical Association (JAMA) comparison criteria, Modified DISCERN Questionnaire (respectively)

Rating	**Definition of Quality**
1	Poor quality and flow; most of the information is missing, not suitable for use by dentists
2	Generally, low quality and flow; Limited use for dentists as only some information is available
3	Medium quality and low standards of flow; contains some important information but does not provide enough information, useful to the basic level for dentists
4	Good quality and flow; The vast majority of important information on the subject has been presented, useful for dentists
5	Excellent quality and flow; very useful for dentists
Criteria	**Explanation**
Authorship	The credentials and links of the author and contributors should be provided
Attribution	It clearly lists all copyright information, citing references and sources for the content
Validity	The first date of the posted content and subsequent content updates should be specified
Explanation	Conflicts of interest, financing, sponsorship, advertising, support, and video ownership should be fully disclosed
Items	**Questions**
1	Are the aims clear and achieved?
2	Are reliable sources of information used? (i.e. publication cited, speaker is a dentist)
3	Is the information presented balanced and unbiased?
4	Are additional sources of information listed for dentistry reference?
5	Are areas of uncertainty mentioned?

The JAMA Benchmark Criteria is a widely accepted four-point scale utilized to evaluate the dependability and accuracy of videos and resources. This scale assesses materials based on four crucial criteria: authorship, attribution, disclosure, and currency (as illustrated in ***Table 1***).[22] Each criterion is awarded one point by the evaluator, resulting in a total score ranging from 0 to 4 points. A score of one point suggests a low level of reliability, while scores of two-three points indicate a partially reliable medium level, and a score of four points signifies a high degree of source accuracy.[24]

The m-DISCERN Questionnaire is an instrument designed to gauge the trustworthiness of resources by evaluating specific features through five yes/no questions (***Table 1***).[22] The questionnaire assesses the dependability of resources by examining their attributes, and the total score is determined by adding up the 'yes' responses, with each 'yes' response worth one point. A score of 0 indicates the least dependable resource reliability, while a score of 5 signifies the most reliable resource reliability. According to the m-DISCERN assessment, video scores surpassing 3 points indicate a good level of reliability, a score of 3 points denotes a moderate level of reliability, and scores below 3 points suggest a poor level of reliability.[25]

Statistical Analysis

Data analysis was conducted using SPSS version 26 for Windows (Chicago, IL, USA). The normality of the data was determined using the Shapiro-Wilk test, which indicated that the data did not adhere to a normal distribution. Consequently, the Kruskal-Wallis test was employed to compare JAMA, GQS, and m-DISCERN

scores between sources and content groups. When a statistically significant difference was detected, Dunnett's post hoc test was used to determine which group was responsible for the difference. To examine the potential correlation between JAMA, GQS, and m-DISCERN scores, the Spearman correlation coefficient was calculated. The level of statistical significance was set at p = 0.05.

Results

The initial screening process comprised a total of 200 videos. After removing duplicates from a collection of 200 videos, a total of 155 videos were selected and ultimately subjected to analysis for evaluation 103 videos were ultimately selected for inclusion in the study following the application of the eligibility criteria ***(Fig. 1)***. The evaluated video data was analyzed, revealing a total of 24691 seconds were examined, with an average length of 239.72 seconds per video. Additionally, the videos received a total of 26.293 likes and an average of 255.27 likes per video. Conversely, a total of 1208 dislikes were recorded, resulting in an average of 11.73 dislikes per video. Furthermore, the videos were viewed a total of 3739263 times, with an average viewing average of 36303.52 per video.

According to the outcomes of the video source categorization, it was determined that dental companies made up the largest proportion of accounts across all categories, with a total of 37.86% (n=39) falling into this classification. The findings disclosed that other sources constituted the least proportion of uploaded video sources, accounting for 5.83% of the overall number of sources (n=6). A visual representation of the distribution of video sources is illustrated in ***Fig. 2***.

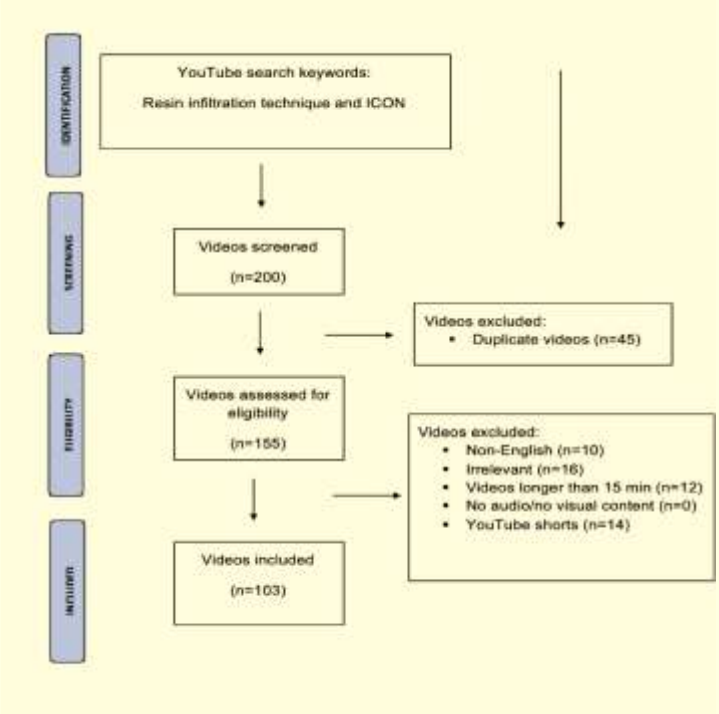

Figure 1. Flow chart of the video selections

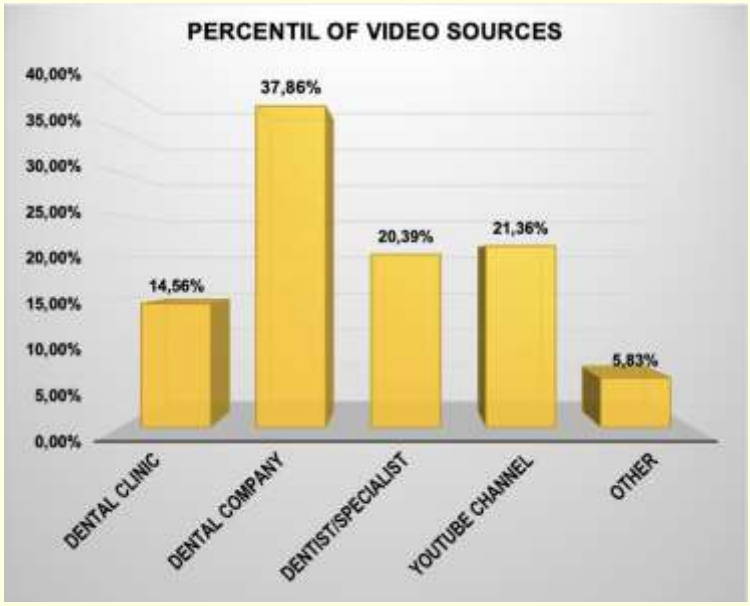

Figure 2. Categorization of YouTube™ videos based on the content

Upon evaluation of the GQS and m-DISCERN scores, it was observed that dental clinics had uploaded the most superior quality and reliable videos in terms of video sources. An examination was conducted based on the JAMA criteria, and it was determined that the dental company's video had achieved the more accurate. While only in the JAMA criteria, there was a significant difference among the sources ($p<0.05$), GQS and m-DISCERN of these videos, no significant differences were found between uploaded sources ($p>0.05$). Regarding the JAMA scores, significant differences were found between the dental clinic, dentist/specialist, and YouTube™ channel groups when compared with the dental company group ($p<0.001$). Additionally, significant differences were observed between all groups and the remaining categories ($p<0.001$). Comparison of assessment scores based on sources was shown in ***Table 2***.

Table 2. Comparison of assessment scores based on sources

Variable	Dental Clinic (n=15)	Dental Company (n=39)	Dentist/Specialist (n=21)	YouTube Channel (n=22)	Other (n=6)	p value
Number of views	1628 (17-134576)	1757 (72-1320649)	3560 (61-177355)	483 (74-85314)	2872 (68-7212)	0.167
Number of likes	10 (0-1365)	12 (0-10000)	43 (0-776)	4.5 (0-904)	30 (0-132)	0.084
Number of dislikes	0 (0-49)	0 (0-515)	2 (0-34)	0 (0-21)	0 (0-3)	0.114
Number of comments	0 (0-178)	0 (0-707)	2 (0-85)	0 (0-50)	0 (0-114)	0.061
Video duration (sec)	104 (53-251)	140 (42-707)	231 (46-1058)	225 (41-538)	287.5 (74-3088)	0.117
Days since upload	1224 (365-4696)	1758 (656-4366)	1911 (312-3548)	1651.50 (184-5326)	1029.50 (379-3442)	0.277
Interaction index (II)	0.79 (0-3.69)A	0.48 (0-1.39)AB	1.42 (0-4.29)B	1 (0-13.65)AB	0.82 (0-6.55)AB	0.015*
Viewing rate	102.75 (3.65-12915.16)	101.52 (4.86-64579.41)	253.05 (3.19-5129.46)	45.04 (4.70-3328.68)	98.24 (4.25-1870.98)	0.204
VPI	1.03 (0-126.10)	1.02 (0-600.33)	2.53 (0-51.18)	0.40 (0-32.53)	0.97 (0-18.29)	0.176
GQS	5 (3-5)	4 (1-5)	4 (1-5)	4 (1-5)	3.5 (2-5)	0.527
JAMA	3 (2-4)A	4 (2-4)B	2 (2-4)A	3 (1-4)A	2 (2-2)C	<0.001*
Modified DISCERN	3 (2-5)	2 (1-5)	2 (1-5)	2 (1-5)	1.5 (1-5)	0.560

*GQS: Global Quality Scale, JAMA: Journal of American Medical Association benchmark criteria

** Upper cases indicate significant differences between lines. Values are presented as median (minimum-maximum)

Outcomes of Contents

The median viewing rate was 101.52 (3.19-64579.41). The GQS had a median value of 4, whereas JAMA had 3, and m-DISCERN had a median value of 2. ***Table 3*** displays the descriptive data for the videos. The videos had mostly high content quality (4-5 points) (65.05 %, n=67). On the other hand, in the JAMA, while the mostly videos had partially medium accuracy (2-3 points) (53.40 %, n=55), in m-DISCERN had below the 3 points poor reliability (60.19 %, n=62). Assessments of the parameters of the videos are shown within ***Table 4.***

Table 3. Descriptive data of the videos

Data	Value (n=103)
Number of Views	1757 (17-1320649)
Number of Likes	15 (0-10000)
Number of Dislikes	0 (0-515)
Number of Comments	0 (0-707)
Video Duration (Sec)	186 (41-3088)
Days Since Upload	1633 (184-5326)
Interaction Index (II)	0.70 (0-13.65)
Viewing Rate	101.52 (3.19-64579.41)
VPI	1.02 (0-600.33)
GQS	4 (1-5)
JAMA	3 (1-4)
Modified DISCERN	2 (1-5)

*Values are presented as median (minimum-maximum)

**GQS: Global Quality Scale, JAMA: Journal of American Medical Association benchmark criteria

Table 4. Assessment of parameters of the videos represented as N (%).

Parameter	Value (n=103)
GQS (1-5 points)	
Low Content Quality (1-2 points)	12 (11.65 %)
Intermediate Content Quality (3 points)	24 (23.30 %)
High Content Quality (4-5 points)	67 (65.05 %)
JAMA Score (0-4 points)	
Low Level Accuracy (1 point)	2 (1.94 %)
Partially Medium Accuracy (2-3 points)	55 (53.40 %)
High Level Accuracy (4 points)	46 (44.66 %)
Modified DISCERN Score (0-5 points)	
Poor Reliability (<3 points)	62 (60.19 %)
Moderate Reliability (3 points)	27 (26.21 %)
Good Reliability (>3 points)	14 (13.59 %)

*Values are presented as number (%).

**GQS: Global Quality Scale, JAMA: Journal of American Medical Association benchmark criteria

When the videos were compared in terms of content (advertisement, educational, patient's pleasure, and other), a significant difference was found only between the II, the GQS, the m-DISCERN and the JAMA criteria parameters (respectively, p< 0.001, p< 0.001, p=0.002, p< 0.001). Values of videos according to content was shown in ***Table 5***.

Table 5. Values of videos according to content

Variable	Advertisement (n=29)	Educational (n=54)	Patient's Pleasure (n=8)	Other (n=12)	P value
Interaction index (II)	0.47 (0-1.39)^{A}	0.98 (0-13.65)^{B}	0.71 (0-1.52)^{AB}	0.33 (0-1.04)^{A}	< 0.001
GQS	4 (2-5)^{A}	5 (1-5)^{A}	2.5 (1-5)^{AB}	3 (1-5)^{B}	< 0.001
Modified DISCERN	2 (1–3)^{A}	3 (1–5)^{B}	2 (1–3)^{AB}	2 (1–3)^{AB}	0.002
JAMA	4 (2–4)^{A}	3 (1–4)^{B}	4 (2–4)^{AB}	3 (2–4)^{B}	< 0.001

*GQS: Global Quality Scale, JAMA: Journal of American Medical Association benchmark criteria

** Upper cases indicate significant differences between lines.

***Values are presented as median (minimum-maximum)

Outcomes of Correlations between Accuracy, Content of Quality, Reliability

The results indicated a substantial positive correlation between; GQS and number of views (r=0.212, p=0.032), number of likes (r=0.349, p<0.001), number of comments (r=0.209, p=0.034), video duration (sec) (r=0.221, p=0.025), II (r=0.404, p<0.001), viewing rate (r=0.324, p=0.001), VPI (r=0.332, p=0.001), JAMA scores (r=0.215 p=0.032), and m-DISCERN scores (r=0.481, p<0.001). While there was a negative correlation between the GQS and days since upload (r=-0.332, p=0.001), JAMA benchmark and II (r=-0.306, p=0.002). JAMA benchmark between m-DISCERN there was a positive correlation (r=0.32 p=0.001). ***Table 6*** displays the correlations between variables and scores.

Table 6. Correlations between quantitative variables and scores

Variable	GQS	JAMA	Modified DISCERN
Number of views	r = 0.212 p = 0.032	r = 0.060	r = -0.031
Number of likes	r = 0.349 p < 0.001	r = -0.111	r = -0.024
Number of dislikes	r = 0.186	r = -0.098	r = -0.117
Number of comments	r = 0.209 p = 0.034	r = -0.095	r = -0.125
Video duration (sec)	r = 0.221 p = 0.025	r = -0.118	r = 0.153
Days since upload	r = -0.332 p = 0.001	r = 0.165	r = -0.083
Interaction index (II)	r = 0.404 p < 0.001	r = -0.306 p = 0.002	r = 0.126
Viewing rate	r = 0.324 p = 0.001	r = 0.009	r = -0.025
VPI	r = 0.332 p = 0.001	r = -0.038	r= -0.055
GQS	-	r = 0.215 p= 0.032	r = 0.481 p < 0.001
JAMA	r = 0.215 p= 0.032	-	r = 0.32 p= 0.001
Modified DISCERN	r = 0.481 p < 0.001	r = 0.32 p= 0.001	-

*Nonparametric Spearman's rank correlation coefficients (rs) are displayed.

**GQS: Global Quality Score, JAMA: Journal of American Medical Association benchmark criteria.

Outcomes of between Accuracy, Content of Quality, Reliability

Video metric data from the GQS, the JAMA and the m-DISCERN were analyzed, the JAMA criteria were evaluated according to accuracy level (low level, partially medium and high level) for each video metrics and criteria, the difference was found between II (p=0.004). Between m-DISCERN (poor reliability, moderate reliability, good reliability) and GQS, there was a statistically difference (p=0.001). On the other hand, in GQS scale (low content, intermediate content, high content), statistically differences were found between GQS-days since upload, GQS-II, GQS-viewing rate, and GQS-m-DISCERN (respectively; p=0.006, p=0.001, p< 0.001). Video metric data were shown related to m-DISCERN in ***Table 7***, GQS scale in ***Table 8***, and m-DISCERN was in ***Table 9***.

Table 7. Modified DISCERN values represented as median

Variable	Poor Reliability (n=62)	Moderate Reliability (n=27)	Good Reliability (n=14)	P value
Number of views	2824 (17–1320649)	2029 (127–134576)	528.50 (74–20443)	0.378
Number of likes	17 (0–10000)	10000 (0–1365)	12 (0–132)	0.811
Number of dislikes	0 (0–515)	0 (0–33)	0 (0–3)	0.418
Number of comments	0.50 (0–707)	0 (0–178)	0 (0–114)	0.306
Video duration (sec)	175 (41–597)	227 (53–1058)	213 (69–3088)	0.356
Days since upload	1718 (184–5326)	1532 (312–4696)	1553 (379–3670)	0.484
Interaction index (II)	0.62 (0–4.62)	0.74 (0–2.93)	1.18 (0–13.65)	0.150
Viewing rate	138.88 (3.19–64579.41)	79.93 (14.92–12915.16)	47.22 (4.70–1870.98)	0.373
VPI	1.14 (0-600.33)	0.80 (0-126.10)	0.46 (0-18.29)	0.465
GQS	4 (1-5)^{A}	5 (3-5)^{B}	5 (3-5)^{B}	**0.001***
JAMA	3 (1–4)	3 (2-4)	3 (2-4)	0.564

*GQS: Global Quality Score, JAMA: Journal of American Medical Association benchmark criteria

** Upper cases indicate significant differences between lines.

***Values are presented as median (minimum-maximum)

Table 8. Global Quality Score (GQS) values represented as median

Variable	Low Level Accuracy (n=2)	Partially Medium Accuracy (n=55)	High Level Accuracy (n=46)	P value
Number of views	59589 (20269–98909)	1628 (17–177355)	1975 (72–1320649)	0.154
Number of likes	482.50 (131–834)	20 (0–904)	8 (0–10000)	0.065
Number of dislikes	29 (9–49)	0 (0–34)	0 (0–515)	0.378
Number of comments	11 (1–21)	0 (0–114)	0 (0–707)	0.244
Video duration (sec)	168.50 (91–246)	227 (41–3088)	139 (42–501)	0.162
Days since upload	2711 (2520–2902)	1508 (312–5326)	1732.50 (184–4696)	0.175
Interaction index (II)	0.70 (0.60–0.79)^{A}	0.94 (0–13.65)^{B}	0.48 (0–2.96)^{A}	0.004*
Viewing rate	2106.32 (804.33–3408.30)	102.75 (3.19–5129.46)	76.65 (4.70–64579.41)	0.223
VPI	19.86 (7.53-32.19)	1.03 (0-51.18)	0.77 (0-600.33)	0.187
GQS	3.5 (3-4)	4 (1-5)	4 (1-5)	0.732
Modified DISCERN	1.5 (1–2)	2 (1-5)	2 (1-5)	0.275

*JAMA: Journal of American Medical Association benchmark criteria

** Upper cases indicate significant differences between lines.

***Values are presented as median (minimum-maximum)

Table 9. Journal of American Medical Association benchmark criteria (JAMA) values represented as median

Variable	Low content quality (n=12)	Intermediate content quality (n=24)	High content quality (n=67)	P value
Number of views	1439 (61-130704)	472 (106–28845)	2884 (17–1320649)	0.074
Number of likes	5 (5–414)	3 (0–258)	24 (0–10000)	0.578
Number of dislikes	0 (0–24)	0 (0–9)	0 (0–515)	0.425
Number of comments	0 (0–50)	0 (0–43)	0 (0–707)	0.107
Video duration (sec)	168.50 (42–590)	150.50 (60–349)	204 (41–3088)	0.304
Days since upload	1858.50 (1459–4008)^{AB}	1846.50 (372–5326)^{A}	1532 (184–4490)^{B}	0.006*
Interaction index (II)	0.33 (0–4.12)^{AB}	0.44 (0–2.28)^{A}	0.85 (0–13.65)^{B}	0.001*
Viewing rate	46.33 (3.19–3758.02)	31.76 (7.14–1013.47)	151.80 (3.65–64579.41)	0.359
VPI	0.46 (0-35.52)	0.26 (0-9.87)	1.52 (0-600.33)	0.349
Modified DISCERN	1.5 (1–5)^{A}	2 (1–4)^{A}	3 (2–5)^{B}	< 0.001*
JAMA	3 (2–4)	3 (1–4)	3 (2–4)	0.848

*GQS: Global Quality Score

** Upper cases indicate significant differences between lines.

***Values are presented as median (minimum-maximum)

Discussion

The purpose of the present study was to evaluate the accuracy, reliability, and quality of YouTube™ videos related to a non-invasive treatment method, the resin infiltration technique, and to determine their sources, content, and demographic characteristics. The ideal color and form of the teeth are important parameters for an esthetic smile.[26] In this age where aesthetics are at the forefront, treatment of common fluorosis and WSL, especially in anterior teeth, is critical for patients for these reasons. There are invasive and minimal invasive treatment options for the treatment of these factors that cause a hypomineralized appearance of the teeth.[27] Minimal invasive treatment options include remineralization with remineralizing agents, microabrasion and resin infiltration technique, ICON.[28]

YouTube™, which is a part of our daily lives, is a means of communication in every field, and in health issues. YouTube™ enables patients to access many video content such as information about disease and treatment and post-treatment satisfaction videos of patients.[17] According to the literature, more than 80% of internet users utilize the internet to access health information.[29] Therefore, it is very important that the uploaded videos have accurate, reliable and high quality content.[29] Otherwise, it is inevitable to have misleading videos alongside informative videos. The assessment of videos containing various types of content that could

potentially disseminate misinformation among patients is a crucial and indispensable area of academic inquiry.

The popularity of YouTube™ as a platform that offers both visual and audio content makes it a frequently visited destination for individuals. In this study, 103 videos out of 155 videos related to resin infiltration technique and ICON were evaluated according to the inclusion criteria. Most of these videos were uploaded by dental company (39), followed by YouTube Channel (22) and dentist/specialist (21). There was no difference in the GQS and m-DISCERN scales when evaluated in terms of video sources. The findings of the present study are supported by a previous study.[30]

The most viewed video in this study had 1320649 views, which is higher than the highest number of views (193437) in the YouTube™ study on WSL.[30] Although the research on WSL was conducted in 2023, the difference in the number of views may be attributed to the growing emphasis on the aesthetic perception of patients and their endeavors to find solutions for lesions that impair the ideal smile.[30] However, it should not be ignored that YouTube™ is a dynamic platform, and the number of views can change very rapidly. In the lights of these outcomes, first hypothesis was partly accepted.

The assessment according to their content quality level, it was found that most of it was high content quality with rate 65.05% (n = 67). In the literature on YouTube™ videos with different types of content, some studies have reported low content quality, which contrasts with our findings.[31,32] It is believed that these variations are caused by differences in the sources from which the videos were uploaded, as well as by the predominance of educational content within the videos.

In light of the present study, YouTube™ mostly contains high-quality videos that provide comprehensive information about the resin infiltration technique. Also, the content accuracy of videos uploaded on YouTube™ was moderate and reliability was poor. In the current study, the accuracy of various sources was analyzed, and it was discovered that videos uploaded by dental companies were more accurate than those posted by dental clinics, dentist/specialist, and YouTube™ channels. The lowest accuracy was associated with videos uploaded by others. Based on the findings, it can be suggested that individuals should refer to the source information on ICON videos before viewing them in order to enhance the accuracy of the uploader.

The levels of quality across advertising, educational, and patient satisfaction videos were found to be comparable. Additionally, the reliability of education, patient satisfaction, and other content videos was also consistent. Our study show that videos uploaded by specialists, such as dentists, generally exhibit higher quality, reliability, and content engagement ratings compared to those uploaded by non-professionals or general users. For instance, videos uploaded by professional organizations or healthcare professionals about accelerated orthodontic treatment, displayed higher interaction index values, reflecting better viewer engagement and trust in the information provided.[33] However, it is also noted that while professional videos may have a higher technical and informational quality, they do not always equate to higher popularity or viewer interaction in terms of likes and comments.[34] This suggests that while professional content may be more reliable, general viewers often engage more with content that is more easily digestible or relatable, albeit of lower quality.[34] These findings could indicate that dentist/specialist sources likely provide more comprehensive and reliable information, resulting in higher interaction indices, as viewers are drawn to credible and professional content when seeking medical information online. It is crucial for dental professionals to ensure they are providing accessible and engaging content to maximize both the reach and effectiveness of their educational materials on platforms like YouTube™. Based on the results obtained, the second hypothesis was partly accepted for both content and sources.

Higher content quality is associated with more likes, indicating that better-quality videos are generally preferred by viewers.[30] The videos with high content quality not only attract more likes but also result in increased viewership, further emphasizing the viewer's preference for high-quality content.[30] Although the present study identified a positive correlation between the accuracy and content quality of videos and their VPI, other research has reported different results.[35] According to that study, VPI which measures video popularity based on likes and views does not increase with higher content quality or reliability.[35] Similarly, the present study supports the findings of Kwak et al.[35], who reported a positive correlation between content quality and video accuracy, indicating that reliable and informative videos are often associated with higher quality. In light of these findings, the third hypothesis was accepted.

The present study has many limitations. However, the most important and unavoidable limitation is that YouTube is a dynamic platform and the information about the videos evaluated changes day by day. It should be taken into consideration that video data may change or new videos may be added during the writing of the article or even until the publication of the article. Another limitation is that only YouTube™ was used for the terms resin infiltration technique and ICON, and a platform such as Google Trends was not utilized. In addition, there was a language restriction in the inclusion criteria such as the video language being English, which means that 10 videos were excluded from the evaluation. Despite these limitations, YouTube™ videos present developments in the resin infiltration technique and ICON.

Conclusion

It is inevitable that patients review YouTube™ videos for health-related problems and solutions. YouTube™ is an important outreach tool, especially for awareness of minimally invasive treatment options such as resin infiltration technique-ICON for WSL and fluorosis. Whilst it is pleasing that the majority of videos are of high quality, caution should be exercised due to poor reliability and moderate accuracy.

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Author Contributions

Sevim Atılan Yavuz: Concept, design, analyses and interpretation, literature search, writing-review.

Zeyneb Merve Özdemir: Design, analyses and interpretation, literature search, writing-review.

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