

Invisalign – A YouTube™ Video Analysis

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Abstract

Background: This study was aimed to assess the quality and content of the YouTube™ videos that provide information about Invisalign.

Methods: As indicated by the Google Trends application, the Invisalign-related YouTube™ videos were searched using the key word “Invisalign”. We selected the 140 videos from the first 156 results obtained after searching the key word “Invisalign” on YouTube™. An 18-point scale system was used to classify the videos into low- and high-content videos. The video information and quality index (VIQI) was applied to determine the quality of the videos. Statistical analyses were done using Chi-square test, logistic regression analysis, Pearson correlation coefficient, and Mann-Whitney U-test. **Results:** 44 videos were classified as high-content and 96 as low-content. Most videos were uploaded by laypeople (64.28%). Definition of Invisalign, Procedure and Instructions were the most commonly discussed topics (85.71%), followed by oral hygiene (48.57%), optimal wear time, No. of trays (45.71%), and attachments (42.85%). Least discussed were third molar extractions (8.57%), Speech problems (22.85%), cost (30%) and Lip scarring and tongue soreness (31.42%). The high-content video groups had a higher mean number of views as compared to low-content video groups (211653 vs. 163817.90, P=0.394) but statistically it was not significant. The high content videos had less “likes” on an average as compared to low content videos (211653 vs. 307056.38, P=0.017) but statistically not significant. There was no difference in the total VIQI score between the groups (P=0.071). **Conclusion:** YouTube™ videos on Invisalign usually had incomplete content. Procedure, oral hygiene, number of trays, attachments, lip scarring and tongue soreness, and optimal wear time were discussed by most videos. Very few videos discussed retention, psychological impact and cost factor. General dentists and orthodontist should be aware of the information available on YouTube about Invisalign. They should be cautious prior advising their patient’s for YouTube™ surfing for Invisalign. Healthcare professionals, academic institutions, and professional organizations have a responsibility for improving the content of YouTube (™) about Invisalign by uploading useful videos, and directing patients to reliable information sources.

Keywords: Social media; YouTube; Invisalign; Orthodontic Patient; Perception

Introduction

Achieving a beautiful, esthetic smile is one of the main goals of orthodontic treatment. However, beauty has both objective and subjective dimensions.^[1] For this reason, the perception of smile esthetics depends upon factors such as social and cultural awareness,^[2] gender,^[3] or the age of the observer.^[4] In this context, the observer’s knowledge and experience is one of the most influential factors.^[2] Conventional orthodontic methods have been associated with a general compromise in facial appearance^[5] raising major concern among patients seeking orthodontic treatment.^[6] Thus, esthetic materials and techniques have been introduced in clinical practice aiming to overcome these limitations.^[7] Ceramic brackets were developed as an alternative to metal brackets and, subsequently, lingual orthodontics, which has gained in popularity and is demanded by patients.^[8] In 1997, Invisalign was created with the vision

of providing an esthetic and comfortable aligner appliance with which doctors could treat their patients. The ability to treat complex cases and acceptance by the profession has resulted in phenomenal growth.^[9]

Today, orthodontic patients are easily able to obtain information using social media throughout the duration of their treatment regarding subjects about which they are curious. However, this may have either a positive or a negative effect on their treatment process depending upon the quality of information

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assessed. In this respect, YouTube is preferred by orthodontic patients, because of the ability it offers to provide visual and audio information, compared with other social media platforms.^[10] Since 2005, YouTube has become a phenomenon for commercial and personal content distribution as well as for social networking, and it is the third most –visited Web site after Google and Facebook.^[11] The ease of uploading videos, constant improvement of Web site content to support online sharing, and quick access to content are the factors that facilitate the growth and appeal of the YouTube Web site.^[12]

As the use of the YouTube Web site has become popular in dentistry and medicine, the quality of YouTube content has been assessed in a variety of studies. In this regard, clinicians should direct their patients to use social media properly during treatment. Consequently, it is possible to foresee that the number of these studies will continue to increase for different topics in different disciplines. Many individuals associate orthodontic treatment with social norms and modern beauty standards. For this reason, it is thought that social media reflects current cultural and social tendencies, affecting the demand for treatment and satisfaction. Assessment of social media content plays an important role in understanding the motivation factors, expectations, and experiences of orthodontic patients.^[13]

In the literature, there are a limited number of studies examining the relationship between social media and Invisalign. Therefore, the objective of this study was to examine the content and quality of YouTube videos on Invisalign.

Material and Methods

The Google Trends application determines the most commonly

used search terms by calculating the search frequency relative to the total search volume in various regions of the world. After a search for “Invisalign” using this application, it was determined that the most commonly used terms were “Invisalign,” “clear braces,” “clear aligners,” “invisible braces” Invisalign and Braces.” When the term “Invisalign” from these concepts was searched without the quotation mark, the Google Trends application determined it was the most commonly used search term for invisible orthodontics [Figure 1].

The search parameters were restricted to the past 5 years and the “Incognito”/”Worldwide” settings to prevent restrictions based on user history and to expand search results. A search was made using the keyword “Invisalign” in the online video streaming Web site YouTube (<https://www.YouTube.com>) using the “relevance level” on September 20, 2019, to evaluate the information on Invisalign. The only search filter used was to “sort by relevance” as the default filter for a YouTube search. The search results in this study were limited to the first 156 videos. The web links of all the videos saved as a folder in a hard disk. More than 90% of YouTube users clicked only the first two pages of search results to receive their intended information, and 89% of these users who could not find what they had searched for on the first page looked at other pages. Eight Commercial ads from YouTube not considered or included in the analysis. As the search results may change on different days, the search result was saved by creating a playlist of the videos that were identified. All video content reviewed by a second examiner to evaluate inter-rater reliability. Multipart videos considered as a single video. Recurrent videos, non-English videos, silent videos, or videos that were longer than 18 minutes in length were not included in the study [Table 1].

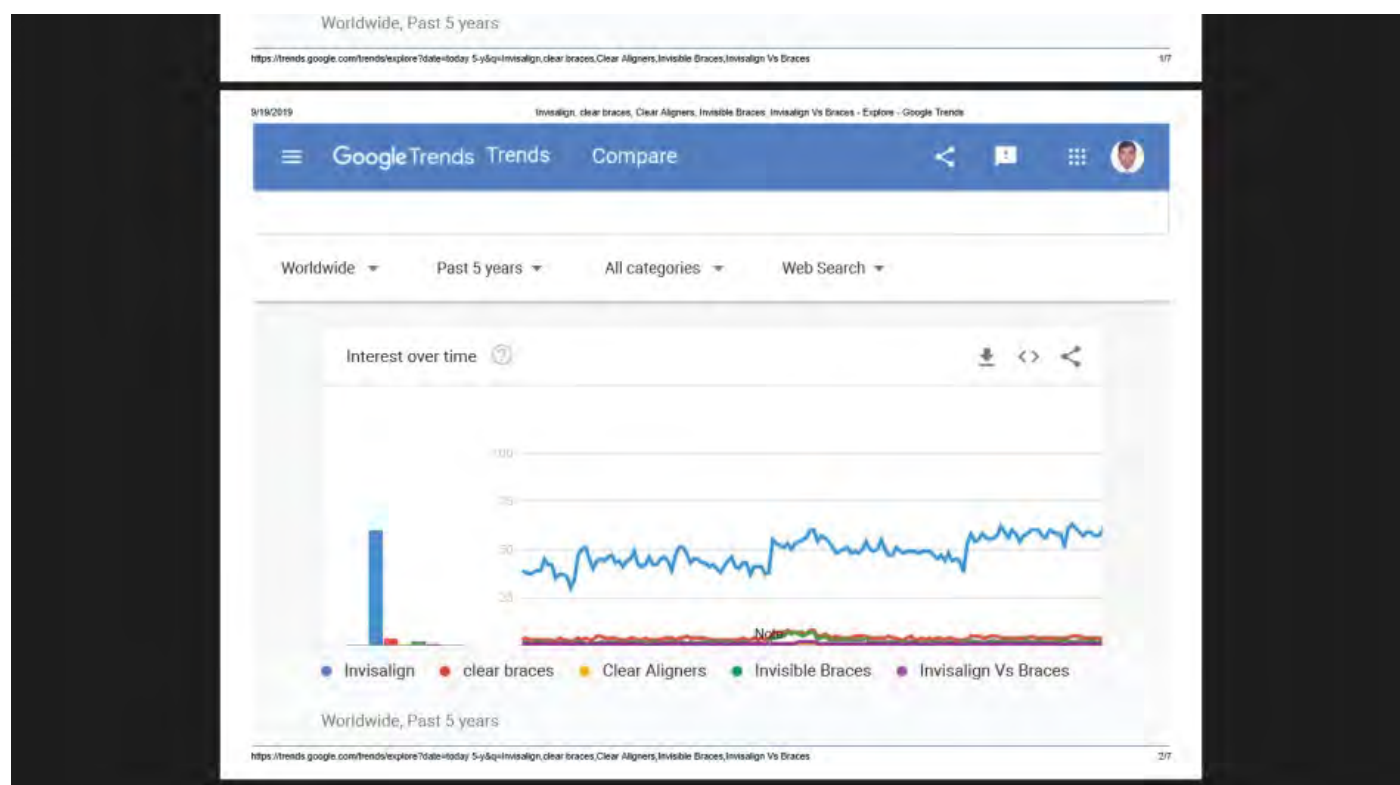


Figure 1: Google Trends, 2019 as on 19-09-2019.

YouTube videos were then assessed for the following content: (1) definition of invisalign, (2) procedure of invisalign, (3) instructions on usage of invisalign, (4) comparison of treatment modalities (labial, lingual, Invisalign), (5) biomechanics, (6) pain, (7) oral hygiene, (8) lip ulcers (9) tongue soreness, (10) speech performance, and (11) psychological and psychosocial impact (12) Cost-effectiveness (13) Retention (14) Attachments (15) Optimal Wear Time (16) Interproximal reduction (17) Third molar extraction and (18) Number of trays [Table 2] Each area of content was given a possible 1 point, for 18 possible points, which was considered as the “total content score” of that video.

Video sources were categorized into five groups, as follows: “dentist/specialist,” “hospital/university,” “commercial” (defined as dental manufacturing company or dental supply company), “layperson,” or “other.” [Table 3] The video information and quality index (VIQI) was used to assess the overall quality of the video.

The VIQI scale uses a 5-point Likert scale ranging from 1 (poor quality) to 5 (high quality) to evaluate the following video characteristics: flow of information, information accuracy, quality (one point each for use of still images, animation, interview with individuals in the community, video captions, and a report summary), and precision (level of coherence between video title and content) [Table 4].

Video features such as time elapsed since upload date, video length, video popularity, audience, likes, dislikes, and

comments were recorded. Viewers’ interaction was calculated using the following interaction index and viewing rate formulas, respectively. [14]

$$\text{Interaction Index} = \left[\frac{\text{Number of likes} - \text{Number of dislikes}}{\text{Total Number of views}} \times 100 \right]$$

$$\text{Viewing Rate} = \left[\frac{\text{Number of views}}{\text{Number of days since upload}} \times 100 \right]$$

Statistical analysis

All statistical evaluations were performed in the SPSS software program (version 22, SPSS Inc, Chicago, Ill). The Shapiro-Wilk test was used to determine whether the data were normally distributed. Pearson correlation coefficients were calculated to examine possible correlations of total content and VIQI scores with YouTube features. Videos scored as 5 points or more were considered high content, and those scored less than 5 points were considered low content videos. For the YouTube variables included in the study, the Mann-Whitney U-test was performed to determine the differences between high-content and low-content videos. The Chi-square test was used to evaluate differences in ownership and target audience among these video groups. Effects of the variables on total content score were assessed using univariate analysis for all YouTube variables. All of the variables were found to be statistically significant and were included in the model that was created for multiple linear regression analysis. 35 videos were randomly selected and

Table 1: Reasons for excluding videos.

S. No.	Reason for Exclusion	No. of Videos
1	No Audio	5
2	No Video	0
3	Not in English	6
4	Not related to subject	3
6	Video Length >18 Minutes	2
Total Exclusions		16

Table 2: Definition of 18 point scale of You Tube™ video demographics.

S. No	Content	Details assessed in the videos
1	Definition	What is Invisalign?
2	Procedure	What is the procedure of Invisalign?
3	Instructions	Instructions to the patient about treatment
4	Comparison	With other available orthodontic treatment options
5	Biomechanics	With other available orthodontic treatment options
6	Pain	Immediately after placement of Invisalign
7	Oral Hygiene	Throughout the Invisalign treatment
8	Tongue Soreness	Throughout the Invisalign treatment
9	Lip Scarring	Throughout the Invisalign treatment
10	Speech Performance	Throughout the Invisalign treatment
11	Psychological Impact	Throughout the Invisalign treatment and after
12	Cost Factor	Intimation before starting treatment including retention charges
13	Retention	Intimation before starting treatment
14	Attachments	Intimation before starting treatment
15	Optimal Wear time	Intimation before starting treatment including retention
16	IPR [Interproximal Reduction]	Intimation before starting treatment
17	3rd Molar Extraction	Intimation before starting treatment
18	No. of Trays	Intimation before starting treatment

reviewed by the same author 15 days later. Intraclass correlation coefficients (ICCs) were calculated to determine intrarater and interrater reliability. The statistical significance level was set at $P < 0.05$.

Results

The initial search using the term “Invisalign” resulted in a total of 13,299 videos. Amongst the 156 videos which were displayed in first two pages, sixteen videos were excluded for a variety of reasons [Table 1]. The descriptive statistics of the video demographics are presented in Table 5. The mean length of YouTube videos on Invisalign was 8 minutes 3 seconds. The mean total number of views was 182951.94. The mean viewing rate was 45164.73. The overall mean number of “likes” was 2281.34 (ranging from 1128 to 3434), whereas the overall mean number of dislikes” was 87.3 (ranging from 52.17 to 122.45). The mean of days since upload was 997.05 days (ranging from

633.93 to 1360.17 days). The high-content video groups had a higher mean number of views as compared to low-content video groups (211653 vs. 163817.90, $P=0.394$) but statistically it was not significant. The high content videos had less “likes” on an average as compared to low content videos (211653 vs. 307056.38, $P=0.017$) but statistically not significant. There was no difference in the total VIQI score between the groups ($P=0.071$). The duration of the videos showed the highest correlation with total content score ($P= .000$) [Table 5].

Other video demographics including ownership and target audience are summarized in Table 6. Most YouTube videos on Invisalign were uploaded by laypeople (64.28%, $n=90$). The target audience of the vast majority of analyzed videos was laypeople (85.71%) rather than dental professionals (5.71%).

Definition of Invisalign, Procedure and Instructions were the most commonly discussed topics (85.71%), followed by oral

Table 3: Distribution of YouTube™ video demographics for the ownership details.

No. of Videos uploaded by.....	Video Demographics about Ownership				
	Dentist/ Specialist	Hospital/ University	Commercial	Layperson	Others
Total	26	4	20	90	0
			140		

Table 4: Distribution of YouTube™ Video demographics for the VIQI assessment between high- and low-content videos.

Variables	High-Content Videos (n=44)				Low-Content Videos (n=96)				P Value
	Minimum	Maximum	Mean	SD	Minimum	Maximum	Mean	SD	
VIQI Assessment									
Flow of information	5	5	5	0.0	5	5	5	0.0	1.00
Information Accuracy	5	5	5	0.0	3	5	4.5	0.7	0.03
Quality	4	5	4.9	0.3	3	5	4.5	0.6	0.12
Precision	2	5	4.6	0.9	1	5	4.2	1.1	0.19

Table 5: Descriptive statistics of the YouTube™ Video.

Variables: Videos Characteristics	Minimum		Maximum		Mean		SD		P-value
	High Content Videos	Low Content Videos	High Content Videos	Low Content Videos	High Content Videos	Low Content Videos	High Content Videos	Low Content Videos	
	No. of views	18221	9481.09	964262	806113	21730	167205	261912	
No. of likes	133	19	16000	7300	2281	12183	3356	1631	0.017
No. of dislikes	2	3	356	339	94.81	94.81	96.92	106.5	0.286
No. of comments	24	0	2228	1689	488.7	488.7	619.3	382.7	0.036
Duration in minutes	9:04	00:36	24:06	13:47	13.5	13:50	04:13	04:04	0.000*
Days since upload	29	126	4643	3865	1019.8	1019.8	1295	960.3	0.915
Interaction Index	0.63	0.09	4.67	3.25	1.81	1.81	1.37	0.90	0.93
Viewing Rate	3031.7	1245.4	602455.7	132763.8	83209.3	83209.3	175050	31873.5	0.582
Total Content Score	10	1	17	9	13:09	5.3	2.1	2.5	0.000*

*Statistical analysis

VIQI content assessment	Minimum		Maximum		Mean		SD		P Value
	High Content Videos	Low Content Videos	High Content Videos	Low Content Videos	High Content Videos	Low Content Videos	High Content Videos	Low Content Videos	
	Flow	5	5	5	5	5	5	0	
Information Accuracy	5	3	5	5	5	4.5	0	0.7	0.033
Quality	4	3	5	5	4.9	4.5	0.3	0.6	0.124
Precision	2	1	5	5	4.6	4.2	0.9	1.1	0.198
Total Score	10	1	17	9	13.09	5.3	2.1	2.5	0.071

hygiene (48.57%), optimal wear time, No. of trays (45.71%), and attachments (42.85%). Least discussed are third molar extractions (8.57%), Speech problems (22.85%), cost (30%) and Lip scarring and tongue soreness (31.42%) [Figure 2]. All parameters were included in the multiple regression analysis. The only parameter which had a significant effect on the total content score was duration in minutes (r^2 0.604 P, .000). Accordingly, there was a positive relationship between total content score and the variable of duration in minutes. VIQI, number of dislikes, and number of comments had a negative relationship with the total content score [Table 7].

Discussion

Nowadays, several orthodontic patients use online tools to be informed regarding their treatment process and use of YouTube™ as one such information source, primarily due to its visual interface is at the forefront, in contrast to the scientific platforms accessible to professionals. However, the validity of the information on YouTube is questionable as a result of the

ease of video sharing and the inability to standardize the content of the uploaded videos.^[15]

Therefore, this study aimed to evaluate the content and video quality of videos related to Invisalign on YouTube. According to content analysis, it is noteworthy that the number of videos with high content was very limited (n=44 high content videos as compared to n=96 low content videos). This suggests that YouTube is inadequate as a source of information in the field of Invisalign treatment. All people ranging from specialists to laypeople can upload videos to YouTube. However, there are no standards established by the system with regard to medical topics. This may explain the low number of high-content videos uploaded regarding medical issues.^[16]

There was no difference in total VIQI score between the high- and low-content video groups (Statistically not significant P= 0.071). This might be the result of following the evolving technology by YouTube users. Although the information accuracy, quality and precision criteria were scored higher in

Table 6: Distribution of You Tube™ Video demographics for ownership, target audience.

Video Demographics	High Content Videos (n=44)	Low Content Videos (n=96)	Total n %
Ownership			
Dentist/ Specialist	6 (13.63)	20 (20.83)	26 (18.57)
Hospital/ University	1 (2.27)	3 (3.12)	4 (2.85)
Commercial	6 (13.63)	14 (14.58)	20 (14.28)
Layperson	31 (70.45)	59 (61.45)	90 (64.28)
Others	0	0	0
Total	44 (100)	96 (100)	140 (100)
Target Audience			
Layperson	36 (81.8)	84 (87.5)	120 (85.71)
Professional	2 (4.5)	6 (6.25)	8 (5.71)
Layperson/ Professional	6 (13.63)	6 (6.25)	12 (8.57)

Pearson Correlation Coefficients between scores for total content score

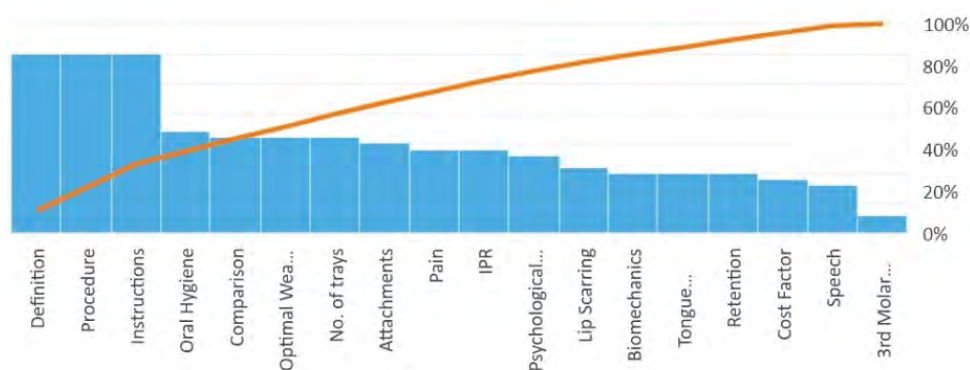


Figure 2: Impact of 18-point score on Total Content Score.

Table 7: The results of multiple regression analysis*.

	B	SE	Beta	t	P value	r ²
Duration in Minutes	0.010	0.002	0.734	4.749	0.000**	.604**
Video Information and Quality Index	0.361	0.301	0.159	1.200	0.240	
Number of Dislikes	-0.014	0.008	-0.316	-1.742	0.092	
Number of Comments	0.001	0.002	0.127	0.691	0.495	

*B indicates unstandardized regression coefficient; SE, standard error; b, standardized regression coefficient; r², coefficient of determination; and VIQI, video information and quality index. ** Statistically Significant.

the high-content video group than in the low-content video group, but they were statistically not significant [Table 4]. This explains the fact that you tube videos uploaded may attract the viewer for the information he/she is searching for but there is no significant/desired information available. Because of the increasing use of the Internet and social media in the medical field by both professionals and laypeople, the need for studies investigating the content and importance of posts on various health related topics is increasing.

There are studies evaluating online information about different fields, such as chronic diseases, including epilepsy^[17] and multiple sclerosis;^[18] medical issues, such as the spread of epidemic diseases^[19] or human papilloma virus;^[20] as well as root canal treatment,^[21] dental implants,^[22] and dental anxiety,^[23] all of which are related more closely to dentistry.

The level of content of videos in the field of orthodontics on YouTube and posts on other social media tools have been assessed in previous studies.^[10,24-27]

Al-Silwadi et al.^[10] investigated the importance of social media in increasing the knowledge level of patients receiving fixed orthodontic treatment and found that social media tools that convey audio-visual information, such as YouTube, increased the knowledge level of orthodontic patients.

In addition, Henzell et al.^[26] concluded in their study of Twitter posts about orthodontics that patients stated their positive and negative feelings about their braces.

In another Twitter analysis,^[24] researchers assessed the “tweets” from patients receiving Invisalign or fixed orthodontic treatments and reported a significant number of positive posts for orthodontic treatment, but no significant differences between these two treatment methods. This study is first of its kind in analysing the content/ information about Invisalign on YouTube videos.

Knosel and Jung^[25] conducted a study to measure the level of knowledge in orthodontic posts in YouTube and concluded that while YouTube is a platform where patient experiences were shared, the relevant videos were insufficient in terms of content. Since feedback from these shares/posts constitutes one of the external factors that determines the attitudes of patients toward orthodontic treatment, it is anticipatory that studies evaluating the level of content on social media would increase.

In our study, the total content score show a positive correlation with parameters such as duration in minutes. The significant difference between high and low video durations suggests that, a particular time should be a target for the video when content is updated. The mean video duration in the high-content video group 13.5 minutes. Because it seems that the viewer’s lost interest in long videos despite increased video content, it is important that the subjects in new video content is presented to viewers in acceptable time durations [Table 5].

Videos of laypeople serve a social purpose by allowing people to share their experiences, but videos produced by healthcare institutions usually have more educational content.^[28]

Laypeople and professionals uploaded 64.28% and 18.57% of the videos in the present study, respectively. There were no videos mentioning all of the contents in the research content as a whole. Many of the uploaded videos contained only few of the specified topics, leading to an increase in the number of low-content videos. When the video content was analysed, the effect on speech (22.85%), third molar extractions as a part of treatment (8.57%), cost of the treatment (30%) and lip scarring and tongue soreness (31,42%) were the least covered points. It is thought that this is because laypeople share more videos than do professionals and because 98% of the target population are nonprofessional individuals. This may be because this subject has not attracted as much attention from patients as have other subjects. The most mentioned topics in videos were the procedure of Invisalign, instructions related to appliance (85.71%) followed by oral hygiene instructions (48.57%), optimal wear time and number of trays during treatment (45.71%), and attachments (42.85%). Issues like lip scarring and tongue soreness during the first week of Invisalign treatment discussed in some of the videos. The most important points in the 18-point score like psychological impact (37.14%) and retention after treatment (28.57%) were also amongst the least discussed.

Limitations of the Study

YouTube content is dynamic, and, therefore, search inquiry results continuously change because interests and video watch times perpetually shift over time. The use of a prolonged study period, however, can often generate an overwhelmingly large volume of social media data, which becomes unmanageable and difficult to analyse. Although the key word was selected using the Google Trends application to determine the single most frequently used term about Invisalign, it should be kept in mind that different videos may be accessed by using different key words. Future studies with a specific content analysis on Invisalign and its impact on the public will be of great importance.

Conclusion

The content of YouTube videos for Invisalign was generally incomplete. Most videos mentioned procedure, oral hygiene, number of trays, attachments, oral hygiene instructions and optimal wear time. Very few videos discussed retention, psychological impact and cost factor. General dentists and orthodontist should be aware of the information available on YouTube about Invisalign. They should be cautious prior advising their patient’s for YouTube™ surfing for Invisalign. Healthcare professionals, academic institutions, and professional organizations have a responsibility for improving the content of YouTube (™) about Invisalign by uploading useful videos, and directing patients to reliable information sources.

Competing Interests

The authors declare that they have no competing interests.

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