ORIGINAL ARTICLE

An analysis of YouTube videos as educational resources for dental practitioners to prevent the spread of COVID-19

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Abstract

Background Coronavirus disease (COVID-19) was first reported on 31 December 2019 and has rapidly been spreading day by day. Dental patients and professionals have a high risk of the coronavirus infection and also have a huge responsibility to prevent its spread during emergency dental treatment over the period of the COVID-19 outbreak.

Aim Informing patients and dental practitioners about the novel coronavirus in an accurate and effective way is very important. Therefore, this study aimed to evaluate the quality of dentistry-related medical information about COVID-19 on YouTube as educational resources for dental practitioners.

Methods YouTube was queried for the search phrases 'COVID-19 and dental practice', 'SARS-Cov-2 and dental practice' and '2019-COV-2 and dental practice'. The first 100 videos for each term were viewed and analysed by 3 independent investigators. The scope was limited to videos in English.

Results The search phrases yielded 1102 videos, among which 802 videos were excluded and 300 videos screened. Fifty-five videos were included in the final analysis. Of the 55 videos, only 2 videos (3.6%) were found to be of good quality, while 24 videos (43.6%) were found to be of poor quality.

Conclusion YouTube is a popular video broadcast site and can provide both relevant educational information and the spreading of misinformation. Health professionals should play a more active role with regard to educative information given on social media, especially YouTube, during global disease outbreaks.

Keywords COVID-19 · Dental general practice · Disease outbreaks · SARS coronavirus

Introduction

A novel pneumonia named coronavirus disease 2019 (COVID-19) was first reported in the Chinese city of Wuhan on 31 December 2019. The transmission routes of this virus include direct transmission by coughing, sneezing and droplet inhalation and contact transmission by coming into contact with the oral, nasal and eye mucous membranes. Dental patients receive dental treatment through a high-speed handpiece or ultrasonic instruments which make their secretions, saliva or blood aerosolise to the surroundings and clinic environment, and the dental apparatus could be contaminated [1]. Unfortunately, symptoms of this disease are non-specific, ranging from asymptomatic to severe pneumonia [2–4]. Dental practitioners who have to treat patients who are in incubation period and unaware if they are infected or patients who need an emergency dental treatment, often ask the following question: 'Are the standard protective measures in daily clinical practice effective enough to prevent the spread of COVID-19 (SARS-CoV-2)?'

There is yet no consensus and guideline regarding infection prevention for dental clinics. However, in almost every country, dentistry communities have issued reports about possible transmission routes and the measures to be taken during the COVID-19 outbreak in dental clinics to prevent and control the infection. Currently, YouTube is a popular online public communication platform with more than 2 billion registered

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users, who receive information about infection control measures during the outbreak periods [5, 6]. Dental practitioners play an important role in preventing the transmission and spread of the infection. A recent study has reviewed various practical strategies to prevent the transmission of the 2019-nCov during dental diagnosis and treatment, including patient evaluation, hand hygiene, personal protective measures for dental practitioners, mouth rinse before dental procedures, rubber dam isolation, anti-retraction handpiece, disinfection of the clinic settings and management of medical wastes [2]. Therefore, YouTube could be a valuable tool to convey this information to dental practitioners during the COVID-19 outbreak. However, unregulated and misleading information taken from YouTube videos can result in the spreading of inaccurate or false information [7]. Therefore, this study aimed to evaluate the usefulness of YouTube videos as an informative tool for dental practitioners regarding additional preventive measures that need to be taken during the COVID-19 outbreak.

Material and methods

To attain the aim of our study, we designed and implemented a cross-sectional study. The study material was composed of all YouTube videos containing information about COVID-19 control procedures for dental practice on 31 March 2020 between 9 AM and 6 PM. YouTube was accessed using the search terms 'COVID-19 and dental practice', 'SARS-Cov-2 and dental practice' and '2019 nCov-2 and dental practice'. The search term 'COVID-19 and dental practice' yielded 554 results, and the 'SARS-Cov-2 and dental practice' term yielded 443 results, while the term '2019 Cov-2 and dental practice' showed 105 results. It has been shown that most YouTube users search the first 60–200 videos and only the first 30 videos [8]. In our study, the first 100 videos for each term were viewed. Exclusion criteria were as follows: non-English videos, duplicate videos and irrelevant videos like other medical field advertisements, financial advice videos and videos about work hours of dental practice. The remaining 55 videos were analysed by three researchers (MOY, EA, BK). All the reviewers were blinded to each other's responses. The researchers did not see the number of likes, dislikes or comments before completing their reviews for objective assessment (Fig. 1). As this study required analysis of publicly available information, Institution Review Board approval was not required.

Variables

For each video, we recorded the number of views; total video duration; total numbers of comments, 'likes' and 'dislikes'; date of upload and country of origin.

Viewers' interactions were calculated based on the interaction index ([number of likes − number of dislikes]/total number of views × 100%) and the viewing rate (number of views/number of days since upload × 100%). Also, all videos were classified according to the source of upload, categorised as American Dental Association (ADA), dental health professionals (general dentists, specialists), dental health centres, news and information websites.

Assessment of content

Videos were classified as quality if they contained scientifically correct information about infection control methods for COVID-19 in dental practice. We evaluated the included videos using the global quality scale (GQS) [9] for the presence of 5 contents: (1) characteristics of 2019-nCoV, (2) treatment and outcome, (3) possible transmission routes, (4) possible transmission routes for dental practice and (5) 2019-nCoV infection controls for dental practice [2]. After the five contents were scored from 1 to 5, the total score was adapted to the GQS score.

Lastly, the overall quality of the videos was scored subjectively using a 5-point Likert-type GQS that awarded a score as follows:

1. Poor quality: poor flow of the video, most information missing, not at all useful
2. Generally poor quality and poor flow: some information listed, but many important topics missing; of very limited use
3. Moderate quality: suboptimal flow; some important information adequately discussed, but other information poorly discussed; somewhat useful
4. Good quality and generally good flow: most of the relevant are information listed, but some topics were not covered; useful
5. Excellent quality and flow; very useful

The reliability of each video was evaluated by means of the Modified DISCERN instrument [10], a five-item questionnaire for assessing health information (scoring: 1 to 5). The items were as follows: (1) Are the aims clear and achieved? (2) Are reliable sources of information used (i.e. publication cited, speaker is specialist in dentistry)? (3) Is the information presented both balanced and unbiased? (4) Are additional sources of information listed for patient reference? (5) Are areas of uncertainty mentioned?

Statistical analysis

Statistical software (SPSS Inc. version 21, IBM, Chicago, IL) was used to analyse the data. The inter-observer agreement was calculated as a kappa score. Descriptive
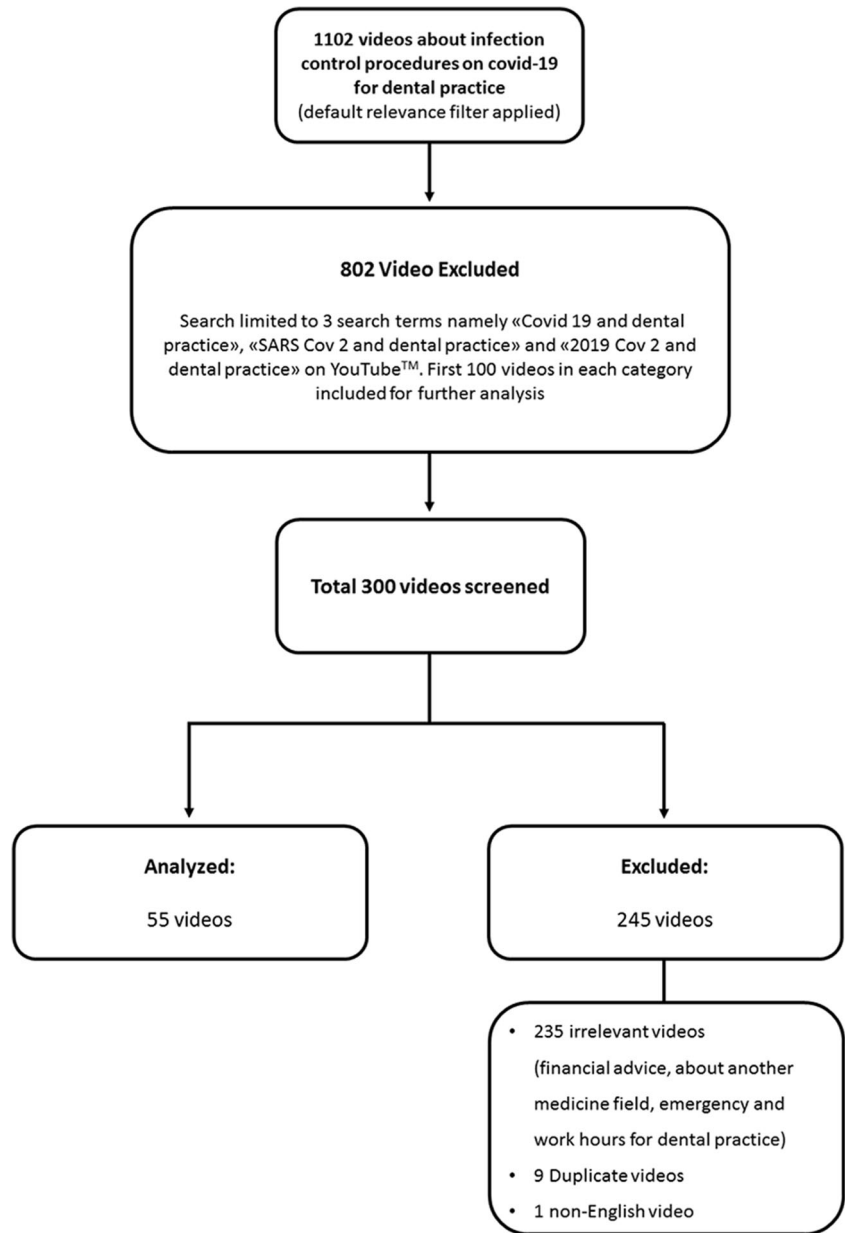
Fig. 1 Detailed workflow diagram

1102 videos about infection control procedures on covid-19 for dental practice (default relevance filter applied)

802 Video Excluded

Search limited to 3 search terms namely «Covid 19 and dental practice», «SARS Cov 2 and dental practice» and «2019 Cov 2 and dental practice» on YouTube™. First 100 videos in each category included for further analysis

Total 300 videos screened

Analyzed:
55 videos

Excluded:
245 videos

- 235 irrelevant videos (financial advice, about another medicine field, emergency and work hours for dental practice)
- 9 Duplicate videos
- 1 non-English video

Fig. 2 Source of upload distribution of analysed videos (%)

- American Dental Association
- Dental Health Professionals
- Dental Health Centers
- News
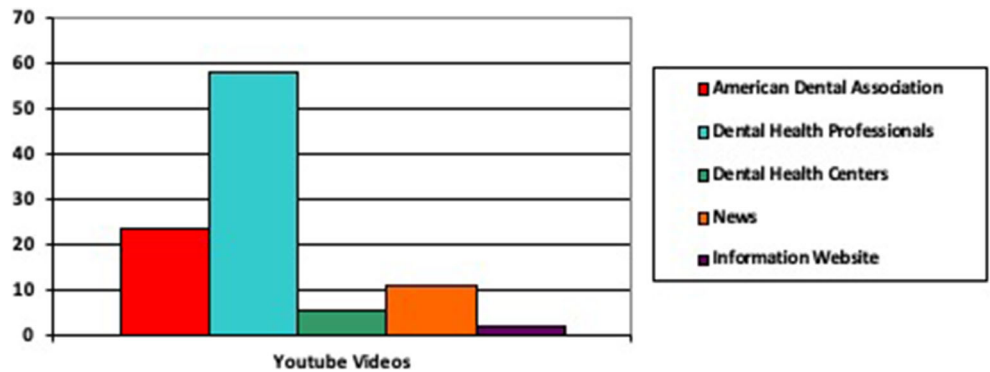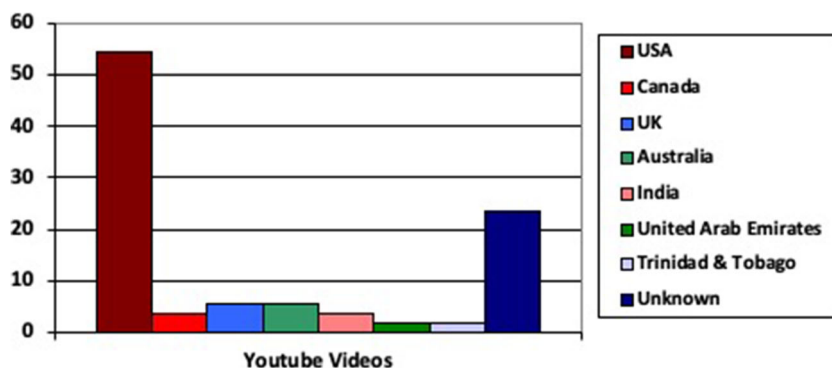- Information Website

Youtube Videos

Fig. 3 Country distribution of analysed videos (%)

statistics were calculated for each variable. Variables were tested for normality using the Shapiro–Wilk test. Continuous variables were analysed using Kruskal–Wallis tests. After the Kruskal–Wallis test, if a significant difference was found, comparisons were evaluated using the Mann–Whitney U test and Bonferroni correction. Categorical variables were analysed using the chi-square test. Correlations were determined using Pearson–Spearman tests. Statistical significance level was set at $p < 0.05$.

Results

The first 100 videos of each term searched were screened for relevance based on our inclusion criteria. After the initial screening, 245 videos were excluded (Fig. 1) and the remaining 55 videos were analysed in this study. Videos were classified based on the source. More than half of the videos (58.2%, $n = 32$) were uploaded by dental health professionals (general dentists, specialists), whereas 23.6% ($n = 13$) were uploaded by ADA, 5.5% ($n = 3$) by dental health centres, 10.9% ($n = 6$) by the news and 1.8% ($n = 1$) by information website (Fig. 2).

Most videos (54.5%, $n = 30$) were uploaded by users in the USA and 21.9% ($n = 12$) by users in other countries (Canada, UK, Australia, United Arab Emirates, India, Trinidad and Tobago). The source of 13 videos was not specified (Fig. 3).

The mean number of comments was 5.56 ± 16.09. The mean video duration was 10 min 11 s $\pm$ 15 min 30 s (range, 54 s to 73 min 37 s). The mean number of views of the videos was 3988.62 ± 7434.14. The mean numbers of likes and dislikes were 37.51 ± 69.97 and 3.82 ± 13.55, respectively. Viewers' interaction with videos was generally positive; the mean interaction index score was $1.99\% \pm 3.24\%$ (range, 0.00 to 3.24%). The mean viewing rate was $3.55\% \pm 5.53\%$. The mean global quality score was 2.03 ± 1.06 and the mean modified DISCERN score was 2.77 ± 0.99 (Table 1).

Fifty-five videos selected were evaluated with the GQS. It was determined that 43.6% of YouTube videos on COVID-19 Infection Control in Dental Practice were of poor quality. The remaining 32.7% of the videos were of a generally poor quality, 12.7% of them were of moderate quality, 7.3% of good quality and only 3.6% of them were of excellent quality (Table 2).

When we compared the content analysis of the videos based on the General Quality Scale (GQS) scores between the groups, 'characteristics of 2019-nCoV' and 'treatment and outcome' values were found to be significantly different between the groups. In the 'characteristics of 2019-nCoV' GQS value mean, dental health centres were significantly higher than ADA ($p = 0.003$) and news ($p = 0.006$). In the 'treatment and outcome' GQS value mean, dental health centres were significantly higher than ADA ($p = 0.004$), dental health professionals ($p = 0.004$) and news ($p = 0.006$) (Table 3). In the comparison of the GQS means, it was found that there is no significant difference between the groups ($p > 0.05$) (Table 4).

Table 1 Characteristics of videos included for analysis. All data was given as mean ± SD

	Analysed videos ($n = 55$)
Number of days	10.76 ± 4.54
Number of comments	5.56 ± 16.09
Number of views	3988.62 ± 7434.14
Number of likes	37.51 ± 69.97
Number of dislike	3.82 ± 13.55
Video duration (min)	10.11 ± 15.30
Interaction index	1.99 ± 3.24
View rate	3.55 ± 5.53
Mean GQS scores	2.03 ± 1.06
Mean modified DISCERN score	2.77 ± 0.99

Table 2 Quality of analysed videos (%)

		Poor quality	Generally poor quality	Moderate quality	Generally good quality	Good quality	Total
Analysed videos	Frequency	24	18	7	4	2	55
	Percent (%)	43.6	32.7	12.7	7.3	3.6	100.0

The Kruskal–Wallis test was used to compare the characteristics of videos between the sources of uploads. Significant differences were found in number of comments, number of views, video duration, interaction index and view rate between the groups ($p < 0.05$). In the mean number of comments, dental health professionals were significantly higher than ADA ($p = 0.000$). On the other hand, in the mean number of views, ADA was significantly higher than dental health professionals ($p = 0.000$) and news ($p = 0.005$). In the video duration mean, news was found to be significantly lower than dental health professionals ($p = 0.004$). In the mean of interaction index, ADA was significantly lower than dental health professionals ($p = 0.000$) and news ($p = 0.001$). It was also found that ADA was significantly lower than dental health professionals ($p = 0.000$) in the mean of view rates (Table 5).

In comparison with modified DISCERN question value means and score mean, only the 4th question (Are additional sources of information listed for patient reference?) was found to be significantly different between the groups ($p < 0.05$). ADA's fourth question value mean was significantly lower than for dental health professionals ($p = 0.000$) (Table 6).

Pearson's correlation analysis showed a significant correlation between like and dislike, view rate, number of comments and viewing rate ($p < 0.05$). There was a positive correlation between dislike and view rate ($p < 0.05$). Several positive correlations were observed between total video duration and detailed contents of videos, GQS score and modified DISCERN question 4 and question 5 ($p < 0.05$). There were positive correlations between video contents and GQS, modified DISCERN question value and DISCERN mean scores ($p < 0.05$).

The overall inter-observer agreement calculated as weighted kappa score was 0.87 (range: 0.84–0.90).

Discussion

In late December 2019, COVID-19 started in Wuhan City and rapidly spread to other countries. On 30 January 2020, the World Health Organization (WHO) declared the COVID-19 outbreak as a 'public health emergency of international concern'; on 11 March 2020, as a pandemic and according to WHO situation report of 31 March 2020, 750,890 cases had been confirmed and 36,405 cases died globally [11, 12]. Everyone has a huge responsibility to prevent the spread of the infection; nevertheless, both dental patients and professionals have a high risk of COVID-19 infection due to the face-to-face treatment, exposure to body fluids such as saliva and blood and the handling of sharp instrument procedures during the interventions [1, 2]. Therefore, it is important to inform the patients and dental practitioners about the novel coronavirus in an accurate and effective way and our study provides a detailed analysis of YouTube videos as a source of dentistry-related medical information about COVID-19.

As known, YouTube is a popular video broadcast site; it is free and easy to access [13]. The use of YouTube may

Table 3 Detailed content analysis of videos based on General Quality Scale (GQS) scores. All data were expressed as median (Q1–Q3) unless otherwise noted

	American Dental Association ($n = 13$)	Dental health professionals ($n = 32$)	Dental health centres ($n = 3$)	News ($n = 6$)	p
Characteristics of 2019-nCoV	1.00 (1.00–1.00)	1.00 (1.00–2.00)	4.00 (3.00–......)[†,‡]	1.00 (1.00–1.00)	0.003*
Treatment and outcome	1.00 (1.00–1.00)	1.00 (1.00–1.00)	2.00 (1.00–......)[†,‡,§,‖]	1.00 (1.00–1.00)	0.048*
Possible transmission routes	1.00 (1.00–3.00)	2.00 (1.00–2.00)	4.00 (4.00–......)	1.00 (1.00–2.25)	0.062
Possible transmission routes for dental practice	1.00 (1.00–4.00)	2.00 (1.00–3.00)	4.00 (1.00–......)	2.00 (1.00–3.00)	0.466
2019-nCoV infection controls for dental practice	2.00 (1.00–4.00)	2.50 (1.00–4.00)	4.00 (1.00–......)	2.50 (1.00–3.25)	0.874
Total score	6.00 (5.00–14.50)	9.00 (6.00–12.00)	16.00 (12.00–....)	8.50 (5.00–10.00)	0.091

Kruskal–Wallis test: *$p < 0.05$ significant difference between groups

Mann–Whitney U test with Bonferroni correction: [†] $p < 0.008$ significantly higher than ADA; [‡] $p < 0.008$ significantly higher than dental health professional; [§] $p < 0.008$ significantly higher than dental health centres; [‖] $p < 0.008$ significantly higher than news

Table 4 Comparison of General Quality Scale according to source of upload. All data were expressed as median (Q1–Q3) unless otherwise noted

	American Dental Association (n = 13)	Dental health professionals (n = 32)	Dental health centres (n = 3)	News (n = 6)	p
GQS (General Quality Scale)	1.20 (1.00–2.90)	1.80 (1.20–2.40)	3.20 (2.40–...)	1.70 (1.00–2.00)	0.091

Kruskal–Wallis test

have a positive impact on professional and public education; during the outbreaks in the past such as Ebola outbreak in 2014 and Zika virus epidemic in 2016 and H1N1 Influenza pandemic in 2009, YouTube videos have been reported to be watched millions of times [14]. COVID-19 epidemic has captured the attention of social media users globally, and in comparison with previous disease outbreaks, the viewership of content related to COVID-19 epidemic appears higher [5, 6, 13, 15].

COVID-19 is reported as transmitted person to person through bodily fluids by cough, sneeze and droplet inhalation or through contaminated objects [1, 2]. Although good hand hygiene is reported and considered to be the most critical measure to reduce the risk of transmitting the microorganism, it is known that COVID-19 is stable for several hours to days in aerosols and on surfaces [16]. A recent study has reported that COVID-19 could be airborne through aerosols during medical procedures [17]. Therefore, the reliability of YouTube videos as a source of information about preventing the spread of COVID-19 for dental practitioners is very important. In the present study, despite 58.2% of the videos were uploaded by dental health professionals, it has been determined that 43.6% YouTube videos on COVID-19 infection control in dental practice were unfortunately in a poor quality. Nevertheless, according to content analysis of videos based on GQS, despite no significant difference between groups in the

comparison on GQS means, 'characteristics of 2019-nCoV' and 'treatment and outcome' mean values were found significantly higher in dental health centres than the other groups.

COVID-19 is rapidly spreading and researches recommend suspending routine dental practices and to treat only dental emergency cases [1, 2]. It is reported that a large number of medical staff get infected until now, so the use of personal protective equipment such as masks, gloves, gowns and face shields to protect skin and mucosa from infected or potentially infected blood or secretion may not be enough to protect patients and dentists from transmission [2, 18]. In the scientific literature, there are some suggestions about infectious diseases in addition to personal protection measures for dental practitioners such as the following: (a) extraoral dental radiographies should be preferred in order to prevent intraoral radiographs' stimulating saliva secretion; (b) patients should be asked to use anti-microbial mouth rise before dental intervention; (c) aerosol-generating procedures should be minimised; (d) if dental intervention is urgently required, rubber dams and high-volume saliva ejectors should be used to minimise aerosol and patients should be treated in a well-ventilated room [2, 19, 20]. In the present study, we analysed the source and quality of dentistry-related scientifically based medical information given by professionals about COVID-19 on YouTube for dental practitioners as demonstrated above. In accordance with the mean modified DISCERN score (2.77 ± 0.99), the

Table 5 Comparison of video characteristics according to source of upload. All data were expressed as median (Q1–Q3) unless otherwise noted

	American Dental Association (ADA) (n = 13)	Dental health professionals (n = 32)	Dental health centres (n = 3)	News (n = 6)	p
Number of days	11.00 (11.00–11.00)	11.00 (4.00–11.00)	9.50 (4.75–13.25)	9.50 (5.00–13.00)	0.840
Number of comments	0.00 (0.00–0.00)	2.00 (0.00–12.50)†	0.00 (0.00–....)	0.50 (0.00–2.00)	0.001*
Number of views	4808.00 (2821.50–17,616.50)‡,‖	548.50 (103.25–2343.00)	201.00 (4.00–....)	314.00 (152.50–2297.50)	0.000*
Number of likes	17.00 (9.00–80.50)	13.00 (2.25–62.25)	0.00 (0.00–....)	4.00 (1.75–32.25)	0.193
Number of dislike	3.00 (0.50–5.00)	0.50 (0.98–2.91)	0.00 (....–....)	0.00 (0.00–2.50)	0.050
Video duration (min)	2.43 (2.19–5.16)	5.02 (2.68–16.10)‖	13.31 (2.18–....)	2.11 (1.31–3.82)	0.004*
Interaction index	0.27 (0.18–0.36)	1.55 (0.98–2.91)†	0.00 (0.00–....)	1.07 (0.66–1.97)†	0.001*
View rate	4.37 (2.57–1.60)	6356.66 (1405.36–2.45)†	2010.00 (36.36–....)	3256.43 (1920.67–2.65)	0.000*

Kruskal–Wallis test: *p < 0.05 significant difference between groups

Mann–Whitney U test with Bonferroni correction: †p < 0.008 significantly higher than ADA; ‡p < 0.008 significantly higher than dental health professional; §p < 0.008 significantly higher than dental health centres; ‖p < 0.008 significantly higher than news

Table 6 Comparison of DISCERN scores according to source of upload. All data were expressed as median (Q1-Q3) unless otherwise noted

Modified DISCERN questions	American Dental Association ($n = 13$)	Dental health professionals ($n = 32$)	Dental health centres ($n = 3$)	News ($n = 6$)	p
Are the aims clear and achieved?	3.00 (2.00–4.50)	4.00 (2.25–4.75)	5.00 (3.00–…..)	3.00 (1.00–3.00)	0.117
Are reliable sources of information used?	4.00 (3.00–5.00)	4.00 (4.00–5.00)	4.00 (3.00–…..)	4.00 (2.50–5.00)	0.899
Is the information presented balanced and unbiased?	3.00 (1.50–4.50)	2.50 (2.00–5.00)	5.00 (3.00–…..)	3.00 (1.00–3.00)	0.306
Are additional sources of information listed for patient reference?	1.00 (1.00–1.00)	1.00 (1.00–2.75)†	5.00 (2.00–…..)	1.00 (…..–…..)	0.006*
Are areas of uncertainty mentioned?	1.00 (1.00–2.00)	1.00 (1.00–2.00)	4.00 (1.00–…..)	1.00 (1.00–1.25)	0.263
Mean of modified DISCERN score	2.40 (1.90–3.40)	2.50 (2.05–3.70)	4.60 (2.40–…..)	2.50 (1.30–2.60)	0.207

Kruskal–Wallis test: *$p < 0.05$ significant difference between groups

Mann–Whitney U test with Bonferroni correction: † $p < 0.008$ significantly higher than ADA

reliability of the videos was potentially important but has shortcomings. Only 2 of the 55 videos were in a good quality; this finding demonstrates the substantial need for improving the quality and reliability of information to achieve better outcomes during outbreak period. However, as a limitation of this study, the information which is available about dentistry-related medical information about COVID-19 on YouTube is only during the initial phase of the COVID-19 pandemic. The epidemic is increasing day by day and YouTube content may have shifted over time and as mentioned in previous studies during epidemics/pandemics, users may be more vulnerable to misinformation, due to the acute effect of infection.

Conclusions

Professional societies should be encouraged to provide useful and reliable information for dental professionals. Health professionals should play a more active role about educative information given on social media, especially YouTube, during global disease outbreaks. Also, further studies are needed to evaluate the videos changes with time of the available YouTube videos during and after the period of the COVID-19 outbreak.

Compliance with ethical standards

Ethical approval Since the present study is an observational study as it involved the use of public access data only, there is no need for approval of the ethics committee.

Conflict of interest The authors declare that they have no conflict of interest.

Informed consent Since the present study is an observational study as it involved the use of public access data only, there is no need for informed consent.

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