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YouTube as a source of information on the radiologic approach to COVID-19

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Ethics Committee Approval
Ethics committee approval was not required because the study data was obtained from YouTube, a public website, and did not contain any animal and patient data.

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Abstract

Background/Aim: Since YouTube videos do not have accuracy filters, there are concerns about the information content. There are no studies specifically addressing the link between “Covid-19" and "radiology" in terms of content, reliability, and efficacy. The study aims to analyze videos posted on YouTube concerning Covid-19 and imaging in English.

Methods: The parameters of 120 most viewed videos on YouTube were recorded with the search of keywords "Covid-19 radiology" and "Covid-19 imaging". Quality Criteria for Consumer Health Information (DISCERN) and medical information and content index (MICI) scores were used to assess the reliability and medical content quality, respectively. The content was evaluated by types of radiological modalities and the patient groups included. Efficacy classification was conducted to assess "informative," "misleading," "individual experience" and "news update" groups. Video sources and target audience were analyzed.

Results: After the exclusion criteria, 55 videos were examined. The informative group (n=49) had a higher MICI score (MICI=8) when compared to the other groups (individual experience: 1 (n=3), news update: 1 (n=3), $P<0.001$). Among the informative ones, 25 videos (51%) were from radiology-related YouTube channels (YC). The MICI and DISCERN scores of the videos, where “radiologists” and “clinicians” make explanations, were significantly higher compared to the “others” group ($P=0.001$, and $P=0.005$, respectively). Computed tomography (CT) was the most frequently mentioned radiologic modality (n=49.84%). Pediatric and pregnant population videos were comparatively rarely offered (n=4.7% and n=3.4%).

Conclusion: The most viewed videos on YouTube about Covid-19 and radiology are reliable and informative videos narrated by radiologists and published by radiology-related channels and radiology societies. Accurate and scientific evidence-based information sharing is important on online social and scientific platforms.

Keywords: COVID-19, Pandemic, Radiology, Imaging, YouTube

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Introduction

Covid-19, an infectious disease caused by the SARS-COV2 virus causing serious pneumonia, first appeared in Wuhan, Hubei Province, China [1]. The World Health Organization officially declared it a pandemic on March 11, 2020. To this date, the total infected cases detected worldwide reached over 83 million, while the number of deaths is over 1.8 million [2]. The controversy in the literature and the social media covers a wide spectrum from the comparison of screening/testing accuracy of PCR versus radiological imaging to increased radiation exposure due to excessive imaging [3, 4].

Restrictions imposed since the beginning of the pandemic increased the consumption of visual media [5]. Video sharing is a rising trend today [6] and YouTube is the main social online platform [7]. YouTube is also used by both patients and healthcare professionals as a source of obtaining and sharing medical information [8]. Health-related information spreads rapidly on the Internet, especially during pandemic periods [9, 10]. However, since there are no filtering criteria on YouTube according to information quality, a large number of videos with low reliability and usefulness are shared along with informative videos without any labeling differences [11].

The study aims to examine the most viewed YouTube videos related to Covid-19 and imaging and to analyze their content during the current pandemic.

Materials and methods

This descriptive study was carried out using YouTube (www.youtube.com) data on 01.01.2021. Ethics committee approval was not required because the study data was obtained from YouTube, a public website and does not contain any animal or patient data.

Selection of the study material

A new YouTube account was created to minimize the effect of search history, cache, and cookies on the search results. “COVID-19 imaging” and “COVID-19 radiology” were used as keywords. Based on view counts on YouTube, the top 60 most frequently viewed videos on the first 3 pages for each keyword were determined to have high relevance [12, 13] and included in the study. Some studies show that YouTube users do not tend to watch videos listed after the first few pages, and over 90% of Internet users look at the first 3 pages of search results [14, 15]. Due to YouTube's continuous variable flow, 120 search results covering the keywords were recorded on a separate list.

Duplicated or irrelevant videos, those without audio and in non-English languages were eliminated. The selection criteria and stages of the study materials are shown in Figure 1.

Assessment of video parameters

Video length, and uploading date, the duration of the video on the site, the number of views, the number of likes and dislikes, and the number of comments of all data were noted. Views per day were calculated as total view/duration, and the like ratio was calculated as (the number of likes x100) / (number of likes + number of dislikes). The video power index (VPI), which shows the popularity of the video, and is calculated as (view ratio x like ratio/100), was also assessed [16].

Assessment of reliability and efficacy

Modified DISCERN score was adapted by Singh et al. from the original 16-question DISCERN tool [17]. Scoring is between 0-5 points and reliability increases as the scores rise.

The efficacy of video content was evaluated under the headings “informative,” “misleading,” “individual experience,” and “news update” [18]. Videos with reliable information based on scientific evidence, those compatible with the title, and that include treatment and prevention techniques, videos addressing the epidemiology, etiology, clinical course, diagnostic methods, and tests, especially the radiological features of the disease, are considered "informative". "Misleading", on the contrary, indicates false, biased, and non-scientific, manipulative videos. "Individual experience" is for videos that cover personal experiences. Videos updated in the light of new information, namely, the demographic characteristics of the pandemic published by news agencies, were evaluated in the category of "news update". Each video was addressed in one category.

Evaluation of video contents and sources

The content of the videos was evaluated by MICI scores [9, 10, 18]. This scoring was performed in five sections: Prevalence, transmission, signs/symptoms, screening/testing and, treatment/outcome. Each section contained 5 different components scored as 0-1, and the total score ranged between 0-25.

Video content was evaluated according to the mentioned imaging methods and the patient groups. Imaging methods were categorized as X-Ray, computerized tomography (CT), ultrasonography (US), magnetic resonance imaging (MRI), and Positron Emission Tomography - Computed Tomography (PET/CT), and patient groups were categorized as adult, elderly, pediatric, and pregnant.

Video sources were evaluated under the headings “radiology-related YC,” “radiology society educational YC”, “radiology department educational YC”, “clinicians,” “commercial,” “news agencies,” and “independent users” according to the posting channels. The narrators of radiology-related YC, radiology society educational YC, radiology department educational YC were listed as a solitary group under the title of "radiologists", while commercial, news agency, and independent user-sourced videos were grouped into "others". Narrators were compared in three categories (radiologists, clinicians, and others)

All videos were evaluated according to the principles mentioned by two independent physicians (ZNT, CSÖ) and interobserver agreement was assessed. In case of inconsistency in the mDISCERN scores and evaluation of efficacy, the videos were re-assessed, and a consensus was reached.

Statistical analysis

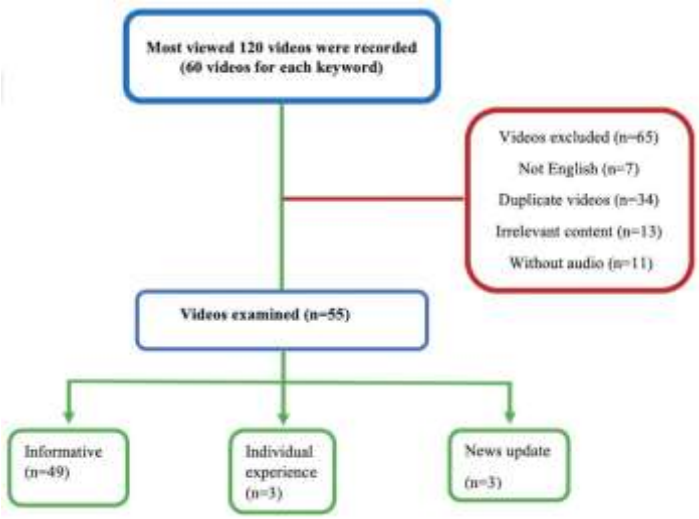
All statistical tests were conducted using the Statistical Package for the Social Sciences 21.0 for Windows (SPSS Inc., Chicago, IL, USA). The Kolmogorov-Smirnov test was used to analyze the normality of the data. Continuous data were expressed as mean (SD) and categorical data were expressed as percentages. The student’s t-test or Mann Whitney U test was used to compare unpaired samples as needed. Among groups of radiologists, clinicians, and others, ANOVA was used for primary analysis to compare the data containing parametric

variables, while the Kruskal-Wallis test was used for nonparametric variables. The agreement between the two physicians was assessed using the Kappa coefficient. Statistical significance was assumed if $P<0.05$ for two-sided.

Results

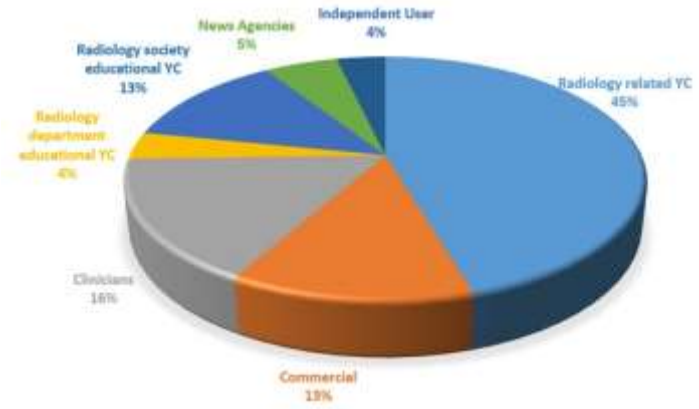
Fifty-five videos were included in the study after the implementation of the exclusion criteria (Figure 1). At the time of analysis, the mean (SD) video upload duration was 242 (67) days, and the median video length was 848 seconds (65-5,808). The median view count was 8,648 (range: 1,719-290,183), and the median view count per day was 36 (0-195). The median likes, dislikes, and comment numbers were 120 (0-4,975), 3 (0-346), and 8 (0-924), respectively. The median VPI of the videos was 31 (0-1,024).

Figure 1: Flowchart of the study



The source of 25 videos (45%) was radiology-related YC, 7 videos (13%) were from radiology society educational YC, 2 videos (4%), from radiology department educational YC, 9 videos (16%) belonged to clinicians, 7 videos (13%) were commercial, 3 videos (5%) were posted by news agencies and 2 videos (4%), by independent users. The distribution of videos by source category is shown in Figure 2.

Figure 2: Distribution of the videos based on source channel category



The median DISCERN score was 4 (0-5), and the median MICI score was 6 (1-19). The target audience in 49 videos (89%) were physicians, whereas it was radiology technicians in 4 videos (7%), and patients in 2 videos (4%).

MICI scale showed that 55 (100%) videos mentioned screening/testing, 8 (14%) mentioned prevalence, 20 (36%) mentioned transmission, 35 (64%), signs and symptoms, and 22 (40%) mentioned treatment/outcome.

Thirty-seven videos (67%) mentioned X-ray, 49 videos (84%) mentioned CT, 12 videos (22%) mentioned ultrasonography, 3 videos (6%) mentioned MRI and 2 videos (4%) mentioned PET-CT as radiological assessment tools. Forty-eight videos (87%) revealed information regarding adult patients, 8 videos (14%), regarding elderly patients, 4 videos (7%), regarding pediatrics, and 2 videos (4%), regarding pregnant patients. Video content based on imaging methods and patient groups is given in Table 1.

Table 1: Video contents according to imaging modalities and patient groups

Contents of videos	n (%)
X-ray	37 (67%)
CT	46 (84%)
US	12 (22%)
MRI	3 (6%)
PET-CT	2 (4%)
Adult	48 (87%)
Elderly	8 (14%)
Pediatric	4 (7%)
Pregnant	2 (4%)

* More than one topic can be mentioned in a video, n number, % percentage

Forty-nine (90%) videos were in the "informative" category, 3 (5%) videos regarded "individual experience," and 3 (5%) videos belonged to the "news update" category. The median DISCERN score was 4 in the "informative" category, 2 in the "individual experience" category, and 3 in the "news update" category. The features of videos and scoring results according to efficacy category are also shown in Table 2.

Table 2: Features of videos by efficacy classification

	Informative	Individual experience	News update
Number of videos (%)	49 (90%)	3 (5%)	3 (5%)
Length of videos (sec)	870 (120-4,240)	1,451 (97-5,808)	135 (65-169)
Video duration (days)	269 (54-365)	249 (184-276)	277 (68-284)
View count	9,984(1,719-290,183)	8648 (5,824-30,279)	5,223 (3,176-55,854)
Views per day	36 (0-1,095)	31 (31-122)	76 (11-202)
Total likes	120 (0-4,975)	251 (113-737)	58 (21-143)
Total dislikes	3 (0-346)	4 (1-20)	4 (4-31)
Comments	8 (0-924)	25 (11-77)	14 (0-14)
VPI	29 (0-1,024)	31 (31-118)	64 (10-166)
DISCERN score	4 (1-5)	2 (2-2)	3 (0-4)
MICI score	8 (1-19)	1 (1-1)	1 (1-4)

The median MICI score was 8 in the "informative" category compared to 1 in the "individual experience" and "news update" categories ($P<0.001$).

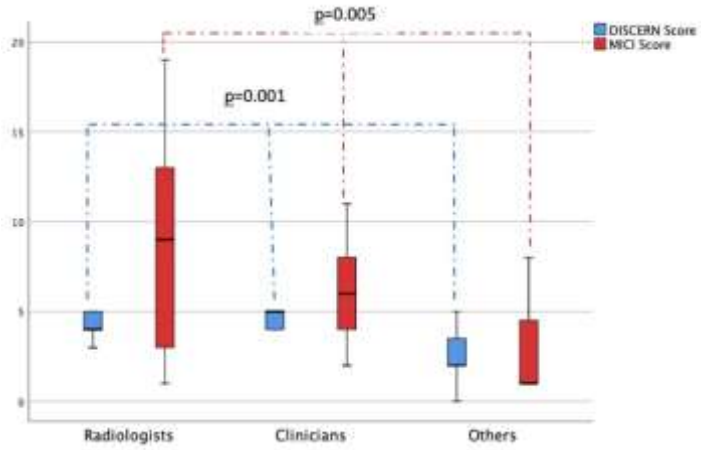
Twenty-five informative videos (51%) were posted by radiology-related YC, 7 videos (14%), by radiology society educational YC, 2 videos (4%), by radiology department educational YC, and 9 videos (18%), by clinicians. Four videos (12%) were commercials and two videos (4%) belonged to independent users. The "individual experience" category was entirely sourced commercially, and the videos in the "news update" category were procured from news agencies. The video characteristics (view count, likes, etc.) were distributed comparably when grouped for the narrators' backgrounds (radiologist, clinician, others) (Table 3). The DISCERN and MICI scores of physician-narrated videos were higher ($P=0.001$ and $P=0.005$, respectively) (Figure 3).

Table 3: Features and scoring of videos by narrator classification

	Radiologists	Clinicians	Others	*P*-value
Number of videos (%)	34 (62%)	9 (16%)	12 (22%)	
Length of videos(sec)	1,042 (120-4,240)	848 (252-2,511)	286 (65-5,808)	0.051
Video duration (days)	266 (54-303)	269 (143-366)	276 (68-292)	0.906
View count	10,428 (3,122-290,183)	15,840(1,719-94,280)	6,054(3,005-148,176)	0.516
Views per day	38(11-1,095)	50(7-350)	30(11-515)	0.569
Like Ratio	98(0-100)	97(0-99)	96(82-100)	0.322
Comments	14(0-924)	5(0-132)	8(0-105)	0.244
VPI	36(0-1,024)	42(0-344)	30(10-511)	0.672
DISCERN Score	4(3-5) [a]	5(4-5) [e]	2(0-5) [a e]	0.001
MICI Score	9(1-19) [a]	6(2-11) [e]	1(1-14) [a e]	0.005

[*] $P<0.05$ between "radiologists" and "clinicians" categories, [a] $P<0.05$ between "radiologists" and "others" categories, [e] $P<0.05$ between "clinicians" and "others" categories

Figure 3: DISCERN and MICI score comparison according to video narrators



Compatibility of efficacy and DISCERN scores were calculated using inter-observer variability analysis. A 100% inter-observer agreement was found during efficacy assessment. Kappa coefficient of agreement for DISCERN was 0.87 ($P<0.001$).

Discussion

Both physicians and patients look for sources where they can access more practical, easily accessible, and comprehensive information on the imaging of Covid-19 disease as the pandemic goes on. Certain groups like pregnant and pediatric patients have somewhat limited options for imaging, as there are limitations due to radiation exposure. Elderly patients with comorbidities and other risk factors may have atypical/different findings and a more challenging differential diagnosis list when being evaluated for possible COVID-19. COVID-19 also introduces considerable stress to the patients' families who in turn may increase their research, especially in times of increased workload and social distancing, which both limit face-to-face time with the physicians. Therefore, patients/families and healthcare professionals frequently use YouTube, which has become an important source of online medical information research and sharing [8].

Lack of peer review before posting and easy access without any credential check frequently results in sub-par information quality in YouTube videos [19] with documentation of misleading, non-evidence-based information postings [20].

Social media is one of the main channels where Covid-19 information is updated [21]. Some of the effects were measured in Zhang et al.'s study, showing a strong correlation between worsening depression and anxiety during the Covid-19 pandemic and behavioral changes in YouTube use [22]. Another study found a comparable correlation between mental health problems in the Covid-19 pandemic and frequent social media exposure [23].

Since social media use is associated with measurable mental health and behavioral changes, accurate information sharing from social media becomes more important. Most studies focused on the social media aspects of prevention and treatment of COVID-19 [12, 24]. To the best of our knowledge, this is the first study reporting on the social media aspects of Covid-19 radiology, which has its controversies.

The majority of the most viewed YouTube videos included in this study were informative, and their DISCERN scores were quite high. The MICI score was significantly higher in the informative group compared to the non-informative group. While MICI scores in the informative group ranged between 6-7 in similar studies, DISCERN scores were in the range of 2-3.5 [9, 25]. In our study, the median scores were 8 and 4, respectively. The videos in our study were partly more comprehensive in terms of medical content and had high reliability compared to those previously discussed in the literature. We think that the fact that most informative videos in the study target physicians and that the videos are narrated by radiologists and clinicians resulted in comparatively higher scores. The main channels of informative videos in the study were radiology-related YC, radiology society educational YC, and clinicians' YC.

The video contents were comparable to regular medical literature, with CT, X-ray, and the US being the most frequently mentioned modalities, and MRI and PET-CT being the least mentioned [26, 27]. Adult and elderly patients with comorbidities were the most common patient groups to be discussed, followed by pediatric and pregnant patients, respectively.

While general COVID-19 discussion for pregnant patients is very prevalent in social media [28], such media consumption is shown to increase anxiety and depression symptoms and the tendency to seek out even more information among pregnant women [29]. These facts show that more accessible and high-quality/informative content should be shared on COVID-19, pregnant women, and imaging. We believe that videos narrated by radiologists, containing simple but comprehensible information about the role of radiation-based methods and alternative imaging modalities such as ultrasonography in COVID-19 will be beneficial for these patients.

Our study shows that the YouTube discussion of COVID-19 radiology is comparatively rare, but the information quality is higher with the most content being posted by physicians and radiology channels. The small sample size, the dynamic nature of the content, and single language choice limit the generalizability of our results. Further studies should focus on the dynamics of discussion and the development of accessible quality control methods when seeking medical information on social media.

Conclusion

The most viewed videos about Covid-19 and radiology on YouTube are highly reliable and informative videos posted by radiology-related channels and societies and narrated by

physicians. It is also important that fast, easily accessible information based on scientific evidence can reach both the patients and the physicians through online social platforms. Therefore, universities, societies established by healthcare professionals, and academicians should continue to deliver accurate and effective information to Internet users as they do on scientific platforms.

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