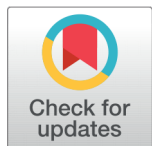


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Exploring Awareness About COVID-19 Using YouTube Videos: based on the user engagement

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Abstract

Objective : Swift desirability of people have arisen towards YouTube videos for keeping abreast of the ever-evolving situation with COVID-19 occurrence. We aimed to determine easy to understand and educationally beneficial 'awareness videos' of COVID-19 available on YouTube, based on the viewers' engagement. **Methods:** We gathered YouTube videos using the phrases 'COVID-19 awareness' and 'Coronavirus knowledge'. Information retrieved included the author's and or publisher's name, the total number of watchers, likes, dislikes, and comments. Educationally useful videos about COVID-19 awareness were recognized based on the viewers' engagement. Videos with correct knowledgeable content were sorted out from impractical videos. Different variables were measured and correlated for the data analysis. **Findings:** Out of a total of 41 retrieved videos, only 15 (36.58%) were shortlisted. Upon further extensive evaluation, 10 (66.67%) were found to have excellent audio-visual content, carrying outstanding awareness, hence designated as educationally useful content. The total likes of all the 10 videos and the number of views/days showed a statistically significant correlation ($r=0.91$, $P=0.000$). Also, a significant correlation was found between the total dislikes and views/day, likes/day, but with the association and with the score of the video, and the merits of the video were not significant. **Novelty:** In the wake of the COVID-19 pandemic, information gathering through online resources has risen. YouTube undoubtedly attracted a very high viewership. People from all professions started to seek and collect essential information about the COVID-19. A remarkable feature of this study was it permitted laymen and healthcare workers in the community to be aware of the ever-changing issue associated with COVID-19. Moreover, it made easy access to the educational videos available on the topic, making it a trendsetter study in the region.

Keywords: COVID19; Pandemic; YouTube; Awareness; Internet Videos; infectious disease

1 Introduction

Taking origin from China, Corona Virus Disease (COVID-19) has briskly traversed the globe making people infected with it. This occurrence has led to a rapid reaction of public, healthcare institutes, and governmental authorities together commenting unremittently to keep everyone informed about the pandemic condition. It frightened the world, creating a situation of distress, anxiety, and fear. It made people think about how to be safe. Therefore, people started to gather information about it.

It has spread at a breakneck pace from its beginning in Wuhan City of Hubei Province of China to the other parts of the world^(1–3). On 31st December 2019, and China alerted the outbreak to the World Health Organization. On 7th January 2020, the virus was identified as a coronavirus. There was an exponential increase in the number of cases, indicative of the point that human-to-human transmission was occurring⁽⁴⁾. Peoples of all ages are prone to get the infection, which transfers through large droplets produced during coughing and sneezing by an infected person. Still, peoples without symptoms can also do the same, even before they start to show up any signs⁽⁵⁾.

Pandemic outbreaks can put substantial mental and physical stress^(6,7) that may lead to unfavorable effects on everyday life during unprepared situations^(8,9). Under such circumstances, people from every walk of life get inclined towards various resources to get updated and accurate related knowledge. We live in a digital era where the dissemination and accessibility of the internet during the last decades has transformed human information and communication behavior⁽¹⁰⁾. Through the internet⁽¹¹⁾, colossal information can easily and rapidly be retrieved and viewed. The healthcare-related information is directly affected because updated information and excellent communication, both, represent a relevant part of it. The use of the internet for gaining access to health-related material is continuously increasing^(12,13).

People feel there is a great need to get aware of the fact, figures, and pertinent details, especially about the health-related issues arising from the current pandemic⁽¹⁴⁾. This necessitates the awareness content (providing common people with the wholesome picture of COVID-19). The internet offers easy and low-cost access to the available material for various remedies resulting in improved health hence. Nowadays, many websites contain health-related information⁽¹⁵⁾ ordinary people, as well as experts in the field of medicine, use YouTube as a readily available search engine when performing health-related research in general and COVID-19 in particular. YouTube is an American online video-sharing platform created in February 2005. This information-rich platform allows viewers to watch, like/dislike, spread, and comment on videos, and subscribe to other users. With additional available resources around still, the people count on online resources, e.g., YouTube, to augment their understanding of various issues^(16,17).

Modern time has witnessed that there has been an expansion in the number of users to be favoring such learning opportunities. As an outcome of these videos, there have been an increase in online learners and also evidence-based practice^(18,19). With such an increase in the number of available content (videos), it is imperative to have judgments on useful content that produces new knowledge or adds up to the existing knowledge about the topic presented. Viewership is taken as a standard criterion whether the video was most liked or disliked. The former one is considered 'educationally beneficial' material. Considering this aspect, we aimed to sort out easy-to-understand COVID-19 YouTube based on the viewers' engagement.

2 Material and Methods

We conducted a systematic search for YouTube COVID-19 videos for the period between 5th June 2020 to 14th July 2020. Our review team work together at this stage to finalize search terms for our study and successfully carried out the literature search process⁽²⁰⁾. As a result, we finalized search phrases i.e. 'COVID-19 awareness', 'coronavirus pandemic knowledge', and 'evidence-based practice of sign and symptoms of COVID-19'. These terms are generally used by laymen and medical experts alike and also match with the aim of our study. All search is done in Saudi Arabia with the google chrome web browser.

During the video exploration on the YouTube site, we used to take the first three pages of videos only with each searching phrase on the YouTube website pages. After the three pages of videos, outcomes were found irrelevant to COVID-19 because beyond three pages of the YouTube search, the findings generally do not match very well to the given query of search keywords^(19,21,22). Subsequently, the entire initial three YouTube pages were checked for the video recovery, and information assortment for each recovered video, the methodological quality evaluation, and information withdrawal was freely abridged in copy by two autonomous specialists medical educationists (AK & KS) using a standard procedure. They also checked all the inclusion and exclusion criteria. Three medical professionals and infection subject experts (HMA, SRH & DMH) grouped the subject, linked with educational and non-educational videos, and do the content examination for all the educationally beneficial videos. A standard information assortment structure was utilized to assure the precise exactness of the collected data by carefully following the pre-set consideration and rejection criteria. We collect and store the information of videos which included, YouTube videos links, the total length of the video (minute/ second), video title, the total number of the views of the video, date of upload, the total number of likes or dislikes of video, the total number of positive and negative comments (if any) related with the video and name of the uploader and publisher of the video.

COVID-19 videos inclusion and exclusion criteria:

All subject-related YouTube videos included in the current study required to be fulfilling the pre-determined essential criteria before being labelled as educationally useful videos. Moreover, the video content must be relevant and scientifically valid, conveying the right knowledge about the awareness of COVID-19. The videos must be prepared (content, slides, animation, and showing proper technique) as well as videos must have been presented in the English language. Many videos with the same COVID-19 awareness-related content (with the same or varying time length), published in YouTube by more than one organization/YouTuber/publisher videos with more than one title, were considered

duplicate and disqualified straightaway. Furthermore, when a similar video/content showed up in a few YouTube videos (published by the same publisher with a different name), only the latest one or the complete video was included in the current study.

The primary criteria for identifying the 'non-educational videos' included videos with the content 'not well demonstrated,' having 'poor audio/s visualization,' with irrelevant and/or disinformation knowledge of the subject, scientifically unproven or not valid information, other than the English language, a piece of news or advertisement, movie documentary or clips these all exclusion criteria in the current study. Furthermore, the date of posting, numbers of views/viewers, number of likes and dislikes, and the maximum number of positive comments were summarized. Additionally, a manual search of the "suggested videos" list from the retrieved YouTube videos results in pages that were also performed for additional, eligible pertinent videos.

Data analysis

We have summarized the collected data from the YouTube videos using a standard form. This data was then entered into Microsoft Excel version 2016 and analyzed using SPSS version 23.0. Analysis of data and outcome variables was achieved through descriptive statistics (Mean, Standard deviation.). Determination of t-value and identification of significant differences was performed through the Statistical t-test (analysis of variance). A correlation was found between like vs. dislike, like vs. total views/day, like vs. like/day, and like vs. dislike/day for all the 'Educational videos' under investigations using Pearson's correlation coefficient (r). The statistical significance level P-value <0.05 was retained during the complete analysis. The videos' credibility was measured as varied scores [(Like-Dislike)/ (Like, Dislike))*100] and videos' merits [(Positive comments-Negative comments)/Total comments)*100].

3 Results

Coronavirus has become a burning issue around the world, and peoples strive in the search for relevant, correct, and updated information about COVID-19 through different digital and social media platforms^(23,24). YouTube is one of the available sources to collect the right information about COVID-19 awareness. So we reviewed YouTube videos about coronavirus awareness. First, we search and download 129 videos based on our searching keywords. Out of 129 search videos of COVID-19 awareness, only 41 videos have to touch the real subject of awareness. After the extensive review of 3 proper rounds of screening by the subject experts and critical analysis of all the 41 retrieved YouTube videos about COVID-19 awareness, only 15 (36.58%) videos were identified as appropriate for COVID-19 helping common people getting aware of it. Initially, 41 videos were found to have a piece of information about COVID-19. After carefully appraising based upon our pre-set inclusion/exclusion criteria, 15 videos were found. Upon further evaluation, out of these 15, only 10 (66.67%) videos were found to carry excellent awareness information with educationally useful content. The remaining 5 (33.34%) videos were either of poor audio-video quality or brought misleading information about COVID-19 information. The total mean duration of these educationally useful COVID-19 videos was 263.80 seconds (SD=160.44) (Table 1).

Table 1. Related information and mean scores of all the 10 COVID-19 videos included in the study

Themes	Mean(SD)	*T(P)
Total second	263.80 (160.44)	5.19 (0.001)
Days	39.80 (20.44)	6.15 (0.000)
Total viewers	3776457.60 (4470948.6)	2.67 (0.026)
Like	58462.0 (76313.30)	2.42 (0.038)
Dislike	1433.40 (1676.24)	2.70 (0.024)
Positive comments	3154.70 (4579.29)	2.17 (0.057)
Negative comments	550.60 (710.09)	2.45 (0.037)
Viewer/day	123838.17 (173378.11)	2.25 (0.050)
Like/ day	2178.43 (2931.47)	2.35 (0.043)
Like/Viewers	0.0202 (0.21)	2.93 (0.017)
Dislike/ Viewers	0.00039 (0.00016)	7.49 (0.000)
Dislike/day	50.58 (66.30)	2.41 (0.039)
Positivecomments/ Like	0.286 (0.66)	1.36 (0.207)
Negativecomments/Dislike	0.755 (1.16)	2.05 (0.071)
**Video Score	93.09 (4.49)	65.44 (0.000)
***Video Merite	69.86 (13.10)	16.85 (0.000)

*Student t test

** Videos scores=((Like-Dislike)/(Like+Dislike))*100

***Videos merits=((Positive comments-Negative comments)/Total comments)*100

On the other hand, the length of educationally useful videos ranged between 90- 663 seconds (Table 2).

The mean (SD) viewership or views/day of all the videos in the current study was 123838.17(SD=173378.11) a large number of peoples watch COVID-19 awareness videos every day (Table 1) whereas, the range of viewership of the educationally useful videos was (58.78 to 534649) (Table 2). A total mean (SD) of 'likes' for all of the 10 COVID-19 awareness videos in the current study was 584620.0 (SD= 76313.30),

Table 2. Detailed information of all the 10 COVID-19 awareness videos included in the study

S.No	Author	Length (min)	SEC	viewer/day	like/day	like/viewer	dislike/viewer	dislike/day	+ve com/like	-ve com/dislike
1	World Health Organization (WHO)	4:48	288	66872.34	356.6301	0.005333	0.000255	17.06849	0.052278	0.270465
2	FreeMedEducation	1:59	119	14173.88	120.3167	0.008489	0.000359	5.083333	0.067738	0.52459
3	World Health Organization (WHO)	1:30	90	82946.16	2059.644	0.024831	0.000305	25.26667	0.019216	0.159191
4	Neural Academy	5:14	314	76963.6	523.5208	0.006802	0.000521	40.08333	0.076843	0.221933
5	Science Insider	5:18	318	534649.9	7132.269	0.01334	0.000368	196.5	0.078829	0.290272
6	AMBOSS: Medical Knowledge Distilled	3:54	234	12880.25	988.8125	0.07677	0.000252	3.25	0.000758	0.019231
7	Vox	3:44	224	334098.9	7826.615	0.023426	0.000407	136.1154	0.037535	0.614015
8	Medmastery	2:36	156	25571.51	126.3077	0.004939	0.000363	9.282051	0.264109	0.743094
9	SciShow	11:03	663	90166.44	2649.667	0.029386	0.000812	73.22222	0.098671	0.714719
10	Independent University, Bangladesh	3:52	232	58.78571	0.517857	0.008809	0.000304	0.017857	2.172414	4

which showed that a large number of users like these COVID-19 videos' ($t=2.42$, $p=0.038$). The total mean of 'dislike' of COVID-19 awareness videos in the current study was 1433.40 ($SD=1676.24$), which also showed that 'like' in these 10 videos, remained much higher than they dislike (Table 1). The minimum number of positive comments made for each COVID-19 video was 12, and the maximum was 14618 (Table 3), and the mean was 3154.70 ($SD=4579.29$) that showed the positive comments in these awareness videos is significantly higher ($t=2.17$; $p=0.05$). The score of videos of all 10 videos range showed excellent 85.77 to 99.34 based on videos 'like' and 'dislike.' The merit of the all video range was 50.69 to 88.05 (Table 3). Detailed information of all 10 COVID-19 awareness videos (for the review purpose) has been reported in Tables 2 and 3. It was soothing that all the 10 awareness videos were produced and uploaded by the professionals, doctors, expert bodies, and university teaching faculties. Also, the link for the concerned publishing groups or authors was available, such as the World Health Organization (WHO), FreeMedEducation, Science Insider and Neural Academy, and more.

Table 3. Access links and related comments of all the 10 awareness videos included in the study

S.no	Links	total views	like	Dislike	positive com-ments	negative com-ments	video score	video merit
1	https://www.youtube.com/watch?v=mOV1aBVYKGA	4881681	26034	1246	1361	337	90.865103	60.306243
2	https://www.youtube.com/watch?v=FC4soCjxSOQ	850433	7219	305	489	160	91.89261	50.693374
3	https://www.youtube.com/watch?v=1APwq1df6Mw	3732577	92684	1137	1781	181	97.576236	81.549439
4	https://www.youtube.com/watch?v=Xj1nUFFVK1E	3694253	25129	1924	1931	427	85.776069	63.782867
5	https://www.youtube.com/watch?v=OOJqHPfG7pA	13900898	185439	5109	14618	1483	94.637572	81.578784
6	https://www.youtube.com/watch?v=syXd7kgLSN8	206084	15821	52	12	1	99.344799	84.615385
7	https://www.youtube.com/watch?v=-LKVUarhtvE	8686571	203492	3539	7638	2173	96.581188	55.702783
8	https://www.youtube.com/watch?v=1PLdl6NDGDE	997289	4926	362	1301	269	86.308623	65.732484
9	https://www.youtube.com/watch?v=p-o-P7luS9M	811498	23847	659	2353	471	94.621725	66.643059
10	https://www.youtube.com/watch?v=EMZ1K-h_fNQ	3292	29	1	63	4	93.333333	88.059701

Table 4 showed the correlation between the total 10 COVID-19 awareness videos, the number of views, and the number of viewers/day were positive and high, and the result was statically significant ($r=0.95$, $P=0.000$). Likewise, a significant correlation was found between the

total views and the Like/day ($r=0.83$, $P=0.002$), the negative correlation found in the total views and the positive comment/ like ($r=-0.31$, $p=0.37$) this negative correlation due to login information required to 'like,' 'dislike' or comment on any YouTube video, so most of the user just view the videos but like, dislike and comments. Additionally, no significant correlation was found with video scores ($r=0.14$, $P=0.70$) and negative correlation found in video merit ($r=-0.011$, $P=0.97$) (Table 4). The total likes of all the 10 videos and the number of views/day showed a statistically significant correlation ($r=0.91$, $P=0.000$). However, no correlation was found between the video scores ($r=0.40$, $P=0.24$) and video merits ($r=-0.003$, $P=0.99$). Also, a significant correlation was found between the total dislikes and views/day, likes/day, but with the association and with the score of the video, and the merits of the video were not significant (Table 4).

Table 4. Correlation between the likes/dislikes, comments, video score, and merit of 10 COVID-19 awareness videos

	Correlation Coefficients						
	Viewer/day	Like/day	dislike/day	Positive comments/Like	Negative comments/ Dislike	Video score	Video Merit
Total viewers	0.95(0.000)**	0.83(0.002)**	0.90(0.000)**	(-0.313(0.37)	(0.312(0.38)	0.14(0.70)	(-0.011(0.97)
Like	0.91(0.000)**	0.96(0.000)**	0.88(0.001)**	(-0.29(0.40)	(-0.26(0.46)	0.40(0.24)	(-0.003(0.99)
Dislike	0.97(0.000)**	0.87(0.001)**	0.94(0.000)**	(-0.31(0.37)	(-0.30(0.39)	0.103(0.77)	(-0.04(0.89)
Positive comments	0.99(0.000)**	0.88(0.001)**	0.96(0.000)**	(-0.24(0.50)	(-0.22(0.53)	0.18(0.60)	0.07(0.84)
Negative comments	0.86(0.001)**	0.94(0.000)**	0.88(0.001)**	(-0.27(0.43)	(-0.20(0.56)	0.19(0.56)	(-0.27(0.44)

** Correlation is significant at 0.01

4 Discussion

Undeniably, the current spread of the COVID-19 pandemic has driven the majority of the countries across the globe into an indeterminate lockdown, resulting in peoples from different walks of life getting stimulated to turn into internet addicts. There is a 50% increase in internet usage in some parts of the world as more characteristics related to our daily lives have shifted online⁽²⁵⁾. People these days are using the internet as a very potent source of information, learning remotely, organizing educational meetings, conferences, classes. Gathering information and awareness about the pandemic (COVID) through videos available on the internet in general and YouTube, in particular, is also included in the list of the daily menu. But is YouTube itself ready for this sudden surge in activity with high quality and valid and reliable content, on the subject of COVID.

Awareness about health topics is essential, and especially amid this pandemic, People require to be updated with information on health-related issues to keep their lives safe and healthy. The internet has arrived in many remote localities and within cosmopolitan cities worldwide, but still, the common man's skill and knowledge for assessing and filtering useful from misleading content lack far below an ideal point. The WHO initiated online training to fight the coronavirus. More than 25 000 people across the globe were able to access and know-how to spot, avoid, react to, and control the new⁽²⁶⁾ coronavirus⁽²⁷⁾. The immense struggle by the WHO Health Emergencies Programme team also resulted in an online course on 26th January 2020 – 4 days before the confirmation of the 2019-nCoV outbreak as a public health emergency of international concern. Such an info-rich resource is currently available in all official UN languages. With such reliable sources of information in place, still, people tend to search, watch, and learn from other internet resources and YouTube videos as an additional or maybe the single information resource as well. We have seen that YouTube videos had been appraised as a basis of facts on vaccination^(28,29), tobacco use⁽³⁰⁾, H1N1⁽³¹⁾, kidney stones^(9,32), basic life support⁽³³⁾, and Tourette's syndrome⁽³⁴⁾.

Our study found that out of 41 videos were found to have a piece of useful information about COVID-19. After carefully appraising based upon our pre-set inclusion/exclusion criteria, 15 videos were shortlisted. Upon further evaluation, out of these 15, only 10 (66.67%) videos were found to be educationally useful, with information on awareness about current pandemic information. The remaining 5 (33.34%) videos were either poor in terms of audio-video quality or information was misleading. Similar findings were claimed when the content of videos was analyzed in the past as well. Exploration about the human papillomavirus (HPV) vaccination established that three-fourths of the video clips (74.9%) delivered positive evidence on the HPV vaccine⁽²⁸⁾.

A total mean (SD) of 'likes' for all of these 10 educationally useful videos about COVID-19 awareness in the current study showed that a large number of users like these COVID-19 videos' Whereas, a past study on immunization discovered that as matched to useful videos, misrepresentative videos were more likely to be viewed and received a higher mean star rating⁽³²⁾.

The current study also reported the total likes of educationally useful videos and the amount of views/day. It showed a statistically significant correlation and remarkable growth of viewership. A good number of users like COVID-19 awareness videos and a very less percentage of users dislike these videos. Moreover, the YouTube videos that were evaluated based on likes and dislikes were almost more than 93.09%. Additionally, these videos showed a positive correlation with the total likes vs. a total number of views/days, and total likes vs. likes/day. A past study, on the H1N1 influenza pandemic, showed that the difference in viewership between useful and misleading videos was not statistically significant⁽³²⁾. The reason could be less information about the virus (H1N1) or lack of its epidemic spread.

5 Conclusion and Future Directions

We can conclude that YouTube videos cover substantial information on COVID-19 awareness, and they have high viewer-ships that show they are easy to understand for the public, regardless of the videos produced by individuals, institutes, and organizations.

We can recommend also while considering the need for time and the ever-changing nature of COVID-19, healthcare authorities should upload updated videos with clear guidelines on continuity of health care facilities and awareness, and YouTube should ponder to establish a robust mechanism for video appraisal and delete videos with misleading information to prevent any potential damage to public health.

Limitations of the study

The available YouTube videos on awareness of COVID-19 were assessed through the number of likes and dislikes. The actual assessment of whether public and healthcare workers got benefited was suspected depending on the user engagement statistics.. Workshops could be arranged using the guidelines described in COVID-19 videos and outcomes of these workshops may be assessed to explore the effectiveness of these videos.

References

- 1) Aker S, Midik Ö. The Views of Medical Faculty Students in Turkey Concerning the COVID-19 Pandemic. *Journal of Community Health*. 2020;45(4):684–688. Available from: <https://dx.doi.org/10.1007/s10900-020-00841-9>.
- 2) Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 10223;2020:497–506. Available from: [10.1016/S0140-6736\(20\)30183-5](https://doi.org/10.1016/S0140-6736(20)30183-5).
- 3) Wang C, Horby PW, Hayden FG, Gao GE. A novel coronavirus outbreak of global health concern. *The Lancet*. 2020;395(10223):470–473. Available from: [https://dx.doi.org/10.1016/S0140-6736\(20\)30185-9](https://dx.doi.org/10.1016/S0140-6736(20)30185-9).
- 4) Rothe C, Schunk M, Sothmann P, Bretzel G, Froeschl G, Wallrauch C, et al. Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany. *New England Journal of Medicine*. 2020;382(10):970–971. Available from: <https://dx.doi.org/10.1056/nejmc2001468>.
- 5) Hawryluck L, Gold WL, Robinson S, Pogorski S, Galea S, Styra R. SARS Control and Psychological Effects of Quarantine, Toronto, Canada. *Emerging infectious diseases*. 2004;10:1206–1212. Available from: <https://dx.doi.org/10.3201/eid1007.030703>.
- 6) El-Zoghby SM, Soltan EM, Salama HM. Impact of the COVID-19 Pandemic on Mental Health and Social Support among Adult Egyptians. *Journal of Community Health*. 2020;45(4):689–695. Available from: <https://dx.doi.org/10.1007/s10900-020-00853-5>.
- 7) Urooj U, Ansari A, Siraj A, Khan S, Tariq H. Expectations, Fears and Perceptions of doctors during Covid-19 Pandemic. *Pakistan Journal of Medical Sciences*. 2020;36(COVID19-S4):37–42. Available from: <https://dx.doi.org/10.12669/pjms.36.covid19-s4.2643>.
- 8) Yan Z, Gaspar R, Zhu T. Emerging technologies, human behavior, and human behavior and emerging technologies. *Human Behavior and Emerging Technologies*. 2019;1(1):4–6. Available from: <https://dx.doi.org/10.1002/hbe2.111>.
- 9) Abdulghani HM, AlRajeh AS, AlSalman BH, AlTurki LS, AlNajashi NS, Irshad M. Prevalence of diabetic comorbidities and knowledge and practices of foot care among diabetic patients: a cross-sectional study. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*. 2018;11:417–425. Available from: <https://dx.doi.org/10.2147/dmso.s171526>.
- 10) Rogers MA, Lemmen K, Kramer R, Mann J, Chopra V. Internet-Delivered Health Interventions That Work: Systematic Review of Meta-Analyses and Evaluation of Website Availability. *Journal of Medical Internet Research*. 2017;19(3):e90. Available from: <https://dx.doi.org/10.2196/jmir.7111>.
- 11) Alsenaidy A, Tauseef A. A review of current state M Government in Saudi Arabia. *Global Engineers & Technologists Review*;2012(2):5–8. Available from: [10.1016/j.resuscitation.2003.09.009](https://doi.org/10.1016/j.resuscitation.2003.09.009).
- 12) Ahmad T, Haque MA, Al-Nafjan K, Ansari AA. Development of Cloud Computing and Security Issues. *Information and Knowledge Management*;2013(3):34–43. Available from: <https://iiste.org/Journals/index.php/IKM/article/view/3969>.
- 13) Ahmad T, Ansari AA, Akhtar A, Parveen S. Current review of ICT and m-government services in Saudi Arabia. *International Journal of Computer Engineering and Applications*. 2014;7(2):71–77.
- 14) Abdulghani HM, Sattar K, Ahmad T, Akram A. Association of COVID-19 Pandemic with undergraduate Medical Students' Perceived Stress and Coping. *Psychology Research and Behavior Management*. 2020;13:871–881. Available from: [10.2147/prbm.S276938](https://doi.org/10.2147/prbm.S276938).
- 15) Cook CJ, Smith GB. Do textbooks of clinical examination contain information regarding the assessment of critically ill patients? *Resuscitation*. 2004;60:129–136. Available from: <https://dx.doi.org/10.1016/j.resuscitation.2003.09.009>.
- 16) Vere J, Gibson B. Evidence-based medicine as science. *Journal of Evaluation in Clinical Practice*. 2019;25(6):997–1002. Available from: <https://dx.doi.org/10.1111/jep.13090>.
- 17) Al-Senaidy AM, Ahmad T, Ms M. Privacy and Security Concerns in SNS: A Saudi Arabian Users Point of View. *International Journal of Computer Applications*. 2012;49(14):1–5. Available from: [10.5120/7692-1014](https://doi.org/10.5120/7692-1014).
- 18) Tilson JK, Kaplan SL, Harris JL, Hutchinson A, Illic D, Niederman R, et al. Sicily statement on classification and development of evidence-based practice learning assessment tools. *BMC Medical Education*. 2011;11(78). Available from: <https://dx.doi.org/10.1186/1472-6920-11-78>.
- 19) Murugiah K, Vallakati A, Rajput K, Sood A, Challa NR. YouTube as a source of information on cardiopulmonary resuscitation. *Resuscitation*. 2011;82(3):332–334. Available from: <https://dx.doi.org/10.1016/j.resuscitation.2010.11.015>.
- 20) Cooper C, Booth A, Varley-Campbell J, Britten N, Garside R. Defining the process to literature searching in systematic reviews: a literature review of guidance and supporting studies. *BMC Medical Research Methodology*. 2018;18(1):85–85. Available from: <https://dx.doi.org/10.1186/s12874-018-0545-3>.
- 21) Abdulghani HM, Haque S, Ahmad T, Irshad M, Sattar K, Al-harbi MM, et al. A critical review of obstetric and gynecological physical examination videos available on YouTube. *Medicine*. 2019;98(30):e16459. Available from: <https://dx.doi.org/10.1097/md.00000000000016459>.
- 22) Ahmad T, Sattar K, Akram A. Medical professionalism videos on YouTube: Content exploration and appraisal of user engagement. *Saudi Journal of Biological Sciences*. 2020;27(9):2287–2292. Available from: <https://dx.doi.org/10.1016/j.sjbs.2020.06.007>.
- 23) Cordos AA, Bolboacă SD. Lockdown, Social Media exposure regarding COVID-19 and the relation with self-assessment depression and anxiety. Is the medical staff different? *International journal of clinical practice*. 2021;75(4):e13933.
- 24) Gozzi N, Tizzani M, Starnini M, Ciulla F, Paolotti D, Panisson A, et al. Collective Response to Media Coverage of the COVID-19 Pandemic on Reddit and Wikipedia: Mixed-Methods Analysis. *J Med Internet Res*. 2020;22(10):e21597.
- 25) Fleming S. Will the coronavirus break the internet?. 2020. Available from: <https://www.weforum.org/agenda/2020/03/will-coronavirus-break-the-internet/> Last accessed: 20October2020.
- 26) WHO. Online training as a weapon to fight the new Coronavirus. 2020. Available from: <https://www.who.int/news/item/07-02-2020-online-training-as-a-weapon-to-fight-the-new-coronavirus> Last accessed: 10September2020.
- 27) Ache KA, Wallace LS. Human Papillomavirus Vaccination Coverage on YouTube. *American Journal of Preventive Medicine*. 2008;35(4):389–392. Available from: <https://dx.doi.org/10.1016/j.amepre.2008.06.029>.
- 28) Keelan J, Pavri-Garcia V, Tomlinson G, Wilson K. YouTube as a Source of Information on Immunization: A Content Analysis. *JAMA*. 2007;298(21):2482–2484. Available from: <https://dx.doi.org/10.1001/jama.298.21.2482>.
- 29) Freeman B, Chapman S. Is "YouTube" telling or selling you something? Tobacco content on the YouTube video-sharing website. *Tobacco Control*. 2007;16(3):207–210. Available from: <https://dx.doi.org/10.1136/tc.2007.020024>.

- 30) Eglash A. Website Review. *Breastfeeding Medicine*. 2009;4(2):119–119. Available from: <https://doi.org/10.1089/bfm.2009.9994>.
- 31) Pandey A, Patni N, Singh M, Sood A, Singh G. YouTube As a Source of Information on the H1N1 Influenza Pandemic. *American Journal of Preventive Medicine*. 2010;38(3):e1–e3. Available from: <https://dx.doi.org/10.1016/j.amepre.2009.11.007>.
- 32) Sood A, Sarangi S, Pandey A, Murugiah K. YouTube as a Source of Information on Kidney Stone Disease. *Urology*. 2011;77(3):558–562. Available from: <https://dx.doi.org/10.1016/j.urology.2010.07.536>.
- 33) Tourinho FSV, de Medeiros KS, Salvador PTCDO, Castro GLT, Santos VEP. Análise de vídeos do YouTube sobre suporte básico de vida e reanimação cardiopulmonar. *Revista do Colégio Brasileiro de Cirurgiões*. 2012;39(4):335–339. Available from: <https://dx.doi.org/10.1590/s0100-69912012000400015>.
- 34) Fat MJL, Sell E, Barrowman N, Doja A. Public Perception of Tourette Syndrome on YouTube. *Journal of Child Neurology*. 2012;27(8):1011–1016. Available from: <https://dx.doi.org/10.1177/0883073811432294>.