Assessment of the reliability, quality, and medical content of hypercholesterolemia videos on YouTube as a source of information

Bir bilgi kaynağı olarak YouTube'daki hiperkolesterolemi videolarının kalitesinin, içeriğinin ve güvenilirliğinin değerlendirilmesi

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Abstract

Aim: YouTube is a favorite video-sharing website that is frequently visited by both patients and healthcare providers for seeking medical information. This study aimed to assess the reliability, quality, and medical content of YouTube videos regarding hypercholesterolemia.

Methods: YouTube.com was searched for the following search terms: "hypercholesterolemia, "high cholesterol," "hyperlipidemia," and "dyslipidemia. Among the 800 videos screened, 132 fulfilled the inclusion criteria and were examined. The reliability and quality of videos were assessed by two five-point scales (modified Quality Criteria for Consumer Health Information (DISCERN) and Global Quality Scale (GQS), respectively).

Results: Of the 132 analyzed videos, 98 (74.2%) were identified as useful, while 34 (25.8%) videos with higher viewership were identified as misleading videos. The reliability (2,68±1,18 vs. 0,94±0,91, p<0.001) and quality points (2,10±1,12 vs. 0,51±0,61, p=0,002) were significantly higher in the useful group. Also, useful videos had higher content on epidemiology (27.5% vs. 11.7%, p=0,006), pathogenesis (34.6% vs. 14.7%, p=0,002), risk assessment and complications (78.5% vs. 23.5%, p<0,001), and pharmacologic treatment (64.2% vs. 11.7%, p<0,001) compared to misleading videos.

Conclusion: The vast majority of YouTube videos on hypercholesterolemia provide useful information with the least viewership. Physicians and healthcare organizations could upload less complex, and patient-specific videos, as YouTube videos affect patient learning, motivation, and behavioral changes.

Keywords: Health education; hyperlipidemia; social media

Öz

Amaç: YouTube, hastalar ve sağlık hizmeti sunucuları tarafından tıbbi bilgi aramak için sıkça ziyaret edilen popüler bir video paylaşım sitesidir. Sunulan çalışma hiperkolesterolemi ile ilgili YouTube videolarının güvenilirliğini, kalitesini ve tıbbi içeriğini değerlendirmeyi amaçlamıştır.

Yöntemler: YouTube.com "hiperkolesterolemi", "yüksek kolesterol", "hiperlipidemi" ve "dislipidemi" arama terimleri ile sorgulandı. Taranan 800 videodan 132'si dahil edilme kriterlerini karşıladı ve analiz edildi. Videoların güvenilirliği ve kalitesi iki beş puanlık ölçek ile (sırasıyla modifiye Tüketici Sağlığı Bilgileri için Kalite Kriterleri (DISCERN) ve Global Kalite Ölçeği (GQS)) değerlendirildi.

Bulgular: Analiz edilen 132 videonun 98'i (%74,2) faydalı, daha yüksek izlenme oranlarına sahip 34 (%25,8) video ise yanıltıcı olarak tanımlandı. Güvenirlik (2,68±1,18'e karşı 0,94±0,91, p<0,001) ve kalite puanları (2,10±1,12'ye karşı 0,51±0,61, p=0,002) faydalı grupta anlamlı olarak daha yüksekti. Ayrıca faydalı videoların epidemiyoloji (%27.5'e karşı %11.7, p=0,006), patogenez (%34,6'ya karşı %14.7, p=0,002), risk değerlendirmesi ve komplikasyonlar (%78.5'e karşı %23,5, p< 0,001) ve farmakolojik tedavi (%64,2'ye karşı %11.7, p<0,001) içerikleri yanıltıcı videolara göre daha yüksekti.

Sonuç: Hiperkolesterolemi ile ilgili YouTube videolarının büyük çoğunluğu, minimum izlenme oranlarıyla birlikte faydalı bilgiler sağlar. YouTube videoları hastaların öğrenmesini, motivasyonunu ve davranış değişikliklerini etkilediğinden hekimler ve sağlık kuruluşları daha basit ve hastaya özel videolar yükleyebilir.

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INTRODUCTION

Increased low-density lipoprotein cholesterol (LDL-C) levels have been identified as a potential risk factor for ischemic heart disease (1). The 2010 World Health Organization Global status report revealed that hypercholesterolemia is estimated to cause almost 3 billion deaths worldwide (2). Although the reduction of LDL-C is a mainstay of cardiovascular disease prevention, only 33.2% of patients with hypercholesterolemia achieved target LDL-C levels (3). Failure to achieve LDL-C targets can be attributed to various factors, such as suboptimal dosing (4), discontinuation of medications due to non-significant side effects, negative media reports (5), and poor adherence.

Internet and social media have become a part of daily life in the modern era. Regular sharing of information about health problems on social media increases online research on drugs, homemade remedies, personal experiences, and alternative treatments. In 2011, it was reported that nearly half of American adults sought a response to their health issues from the Internet (6). YouTube, one of the most frequently used video-sharing platforms, was created in 2005 and the daily total watch time of videos has reached hundreds of millions of hours (7).

Various studies have already evaluated the accuracy and quality of medical information on YouTube videos, including rheumatoid arthritis (8), heart failure (9), hypertension (10), and the coronavirus disease 2019 (COVID-19) pandemic (11). Interestingly, 72% of patients seeking medical information believed that most of the information was available on the Internet, and 69% of them reported never having seen wrong or misleading information (12). To the best of our knowledge, no study has evaluated YouTube videos associated with hypercholesterolemia. Hence, this study was conducted to investigate the content, quality, and reliability of hypercholesterolemia-related videos posted on YouTube.

MATERIAL AND METHODS

Selection of videos and data collection

YouTube (http://www.youtube.com) was searched anonymously on June 2, 2022, using the keywords "*hypercholesterolemia*, "*high cholesterol*," "*hyperlipidemia*," and "*dyslipidemia*." It has been previously shown that users on results click only the first pages of internet searches (12). Therefore, only the first 200 videos for each search term were retrieved for analysis. Exclusion criteria were determined as non-relevant videos, non-English videos, or videos that had no accompanying audio. Multipart and duplicated videos were considered as one video. Following the initial search, 800 videos were reviewed and 668 videos were excluded because they were non-related (n = 72), non-English (n = 284), or silent (n = 28). Three hundred and seventy-four duplicated videos were reexamined and added as 90 videos. Ultimately, 132 videos fulfilled the inclusion criteria (Figure 1). The number of views, likes, dislikes, comments, age of the video, and video length were gathered for each video. To calculate the video rating as views per day, the upload times of the videos were also recorded.

Ethics committee approval

Publicly available YouTube videos were analyzed, and no human participants or animals were recruited for the study; therefore, ethical approval was not required, similar to other similar YouTube studies.

Assessment of usefulness

Two independent authors assessed videos for scientific reliability and educational content. In the case of discrepancy, a consensus was reached through reevaluation and agreement. The current guidelines were used as benchmarks for video accuracy and usefulness (13-15). Afterward, videos were classified into two information groups: useful and misleading.

Useful information: Includes scientifically correct knowledge on epidemiology, pathogenesis, risk assessment and complications, prevention and lifestyle modifications, and pharmacologic treatment. If the video did not clearly explain either of the aforementioned contents but provided general accurate knowledge about hypercholesterolemia, it was categorized as a useful video. If the video consists of both accurate and inaccurate knowledge, it was categorized as a misleading video.

Misleading information: If the video includes scientifically unproven knowledge, e.g. scientifically unconfirmed claims regarding the treatment of hypercholesterolemia with herbal remedies, scientifically

unproven dietary regimens, advertisements on supplements with unknown products, misinformation messages, and claims of abolishing treatment necessity.

Assessment of video content

Videos were evaluated for the existence of content regarding epidemiology, pathogenesis, risk assessment and complications, prevention and lifestyle changes, and pharmacological treatment. Complementary and alternative treatments such as red yeast rice, phytosterols, omega-3 fatty acids, soy, ginger/garlic supplementation, herbal products with unknown content, yoga, acupuncture, and ayurvedic medicine were noted. An advertisement of products was also recorded for each video.

Source of upload and target audience

The videos were categorized into five groups based on their source as follows: 1) universities or professional organizations; 2) health information websites; 3) nonprofit physician/nonprofit healthcare providers; 4) medical advertisements or for-profit organizations; and 5) other media (for personal use, news agency vs).

Additionally, all videos were classified into three groups based on the target audience as healthcare specialists, patients, and the unspecified group that were addressed by the videos. Furthermore, the videos were classified into four groups based on the explaining speaker, such as a physician, non-physician health provider, individuals, and external voice.

Assessment of quality and reliability

To evaluate the overall quality and reliability of videos, five-point scales were used similar to previous studies. (8-10) Video reliability was assessed by the modified Quality Criteria for Consumer Health Information (DISCERN) tool. Video quality was assessed by the Global Quality Scale (GQS).

Statistical analysis

Data were presented as mean ± standard deviation and median (minumum-maximum) for continuous variables, where appropriate. Frequencies (percentiles) for categorical variables. Student's T-Test and Mann Whitney U test were used for independent two-group comparisons and One Way ANOVA/Kruskal Wallis test for more than two independent group comparisons due to results of the Shapiro Wilk test and Q-Q plots depending on the distributional properties of the data. When the p-value from the Anova and Kruskal Wallis test statistics was statistically significant, post hoc comparison tests (Duncan and Dunn) were used to determine which group differed from the others. The chi-square test was used for proportions, and its counterpart Fisher's Exact Test was used when the data were sparse. Kappa statistics were used for the nominal outcome variables to evaluate the agreement between the two observers, while the intra-class correlation coefficient (Two Way Random - Absolute Agreement Model) was used for the continuous variables. A "p" value of less than 0.05 was considered statistically significant, and data were analyzed using standard statistical software (SPSS, Statistical Package for the Social Sciences, version 22, Chicago, IL, USA).

RESULTS

Inter-observer agreement was positive when categorizing the videos as useful and misleading (kappa coefficient = 0.823). The intra-observer correlations for observations one week apart were calculated as 0.97 and 0.96, respectively, for the authors.

Of the analyzed videos, 74.2% (98/132) provided useful information and 25.8% (34/132) contained misleading information. The viewership, reliability, and quality analysis of videos are encapsulated in Table 1. Both groups were similar regarding the age of video on YouTube (p=0.408). The number of total views and views per day was significantly higher for misleading videos than for useful videos (p<0.001 for both). The median video length was shorter in misleading videos compared with useful videos (p=0.02). Viewership parameters (likes, dislikes, and comments) were significantly higher in misleading videos than in useful ones (p=0.007, p=0.03, and p=0.003, respectively). The useful videos had higher scores for reliability and quality assessed using modified DISCERN (2.68±1.18 vs 0.94±0.91) and GQS (2.10±1.12 vs 0.51±0.61) compared to the misleading ones (p<0.001 and p=0.002, respectively).

Among the 132 videos analyzed, useful videos had higher content in terms of epidemiology (27.5% vs 11.7%), pathogenesis (34.6% vs 14.7%), complications and risk assessment (78.5% vs 23.5%), and pharma-

Table 1. Viewership, reliability, and quality analysis of videos

Characteristics	Useful information	Misleading information	*p*
	n=98 (74.2%)	**n=34 (25.8%)**	
Total views	46714,19±169559±12	286116,11±534715,76	***<0,001***
Views per day	39,39±107,57	324,58±659,87	***<0,001***
Video length (minute)	20,34±48,90	7,90±10,92	***0,02***
Age of the video on YouTube (months)	37,69±30,28	32,91±28,36	0,408
Likes	376,50±1388,11	3912,64±7182,53	***0,007***
Dislikes	24,05±99,71	156,17±334,58	***0,03***
Comments	22,37±70,37	258,58±428,08	***0,003***
Reliability score	2,68±1,18	0,94±0,91	***<0,001***
GQS score	2,10±1,12	0,51±0,61	***0,002***

GQS: Global Quality Scale, Variables are presented as mean ± standard deviation, median or frequency (%) values, n: Number

Table 2. The content, source, and target audience analysis of videos.

Characteristics	Useful information	Misleading information	*p*
	n=98 (74.2%)	**n =34 (25.8%)**	
Video Contents			
Epidemiology, n (%)	27 (27.5%)	4 (11.7%)	***0,006***
Pathogenesis, n (%)	34 (34.6%)	5 (14.7%)	***0,002***
Complications and Risk assessment, n (%)	77 (78.5%)	8 (23.5%)	***<0,001***
Prevention and Lifestyle modification, n (%)	49 (50%)	14 (41.1%)	0,177
Pharmacologic treatment, n (%)	63 (64.2%)	4 (11.7%)	***<0,001***
Alternative treatments, n (%)	8 (8.1%)	23 (67.6%)	***<0,001***
Advertisements, n (%)	21 (21.4%)	18 (52.9%)	***0,001***
Source of upload, n *(%)*			
Universities/professional organizations	21 (21.4%)	1 (2.9%)	***<0,001***
Health Information Web Sites	17 (17.3%)	2 (5.8%)	***<0,001***
Non-profit physician/healthcare provider	32 (32.6%)	2 (5.8%)	***<0,001***
Medical advertisement/for-profit companies	17 (17.3%)	10 (29.4%)	***0,023***
Other Media (Individual Users/ News Agency)	11 (11.2%)	19 (55.8%)	***<0,001***
Speaker, n (%)			
Physician	52 (53%)	10 (29.4%)	***0,001***
Non-physician health provider	9 (9.1%)	3 (8.8%)	0,123
Individual in the video	3 (3%)	12 (35.2%)	***<0,001***
External voice	34 (34.6%)	9 (26.4%)	0,178
Target Audience, n (%)			
Healthcare specialists	38 (38.7%)	2 (5.8%)	***<0,001***
Patients	47 (47.9%)	28 (82.3%)	***<0,001***
Unspecified	13 (13.2%)	4 (11.6%)	***<0,001***

n: Number, %: Percentage

cologic treatment (64.2% vs 11.7%) compared to misleading videos (p<0.05). However, there was no significant difference between the two groups according to the prevention and lifestyle modification content (p=0.177). Alternative treatment (67.6% vs 8.1%) and advertisements (52.9% vs 21.4%) related contents were significantly higher in misleading videos than in useful videos (p<0,001 and p=0,001, respectively).

Most of the useful videos on YouTube were uploaded by nonprofit physicians/healthcare providers

Table 3. Detailed analysis of video characteristics by the source of upload

	Universities/ professional organizations	Health information websites	Non-profit physician / non-profit health care provider	Medical advertisement/ for profit companies	Other Media	*p*
Video number [n (%)]	22 (16,7)	19 (14,4)	34 (25,8)	27 (20,5)	30 (22,7)	0,146
Reliability score [Median (Min.-Max.)]	4 (1-5)[a]	2 (1-3)[b]	3 (1-5)[b]	2 (0-3)[b]	1 (0-4)[c]	***<0,001*** *
GQS score	3,5 (1-5)[a]	2 (1-3)[b]	2 (1-4)[b]	1,5 (1-3)[b]	1 (1-2)[c]	***<0,001*** *
Average views	2892 (40-62267)[c]	16875 (63-201866)[c]	1921 (12-346557)[c]	31380 (25-2241529)[a]	13686 (57-1606932)[b]	***0,001*** *
Video length (min)	9,72 (1,31-73)[a]	2,32 (0,42-19,36)[b]	7,89 (0,42-369)[a]	3,27 (0,31-63)[b]	4,77 (1,07-2577)[b]	***<0,001*** *
Views per day	2 (0,64-79,82)[c]	13,34 (0,40-82,82)[c]	2,34 (0,10-466)[c]	46,10 (0,15-2873,70)[a]	23,24 (0,70-2337,62)[b]	***<0,001*** *
Likes	14(0-194)[b]	65(0-7449)[b]	10 (0-5216)[b]	302 (1-23976)[a]	145,5 (0-25814)[ab]	***<0,001*** *
Dislikes	1 (0-50)[a]	6 (0-170)[a]	1 (0-139)[a]	27 (0-1550)[b]	7 (0-958)[ab]	***<0,001*** *
Comments	1 (0-26)[c]	4 (0-371)[c]	1 (0-257)[c]	55 (0-673)[a]	10,5 (0-2286)[b]	***<0,001*** *
Video Content, (n)						
Epidemiology	15/21	2/19	9/34	2/27	3/27	***<0,001*** #
Pathogenesis	12/21	6/19	10/34	8/27	2/27	***0,009*** #
Risk Assessment and Complications	20/21	13/19	24/34	14/27	13/27	***0,003***
Prevention and Lifestyle modification	14/21	13/19	9/34	15/27	10/27	***0,007***
Pharmacologic treatment	20/21	8/19	28/34	5/27	6/27	***<0,001***
Alternative treatments	0	4/19	3/34	14/27	17/27	***<0,001*** #
Advertisements	0	4/19	5/29	20/27	8/27	***0.034*** #

GQS: Global Quality Scale, min: Minute, Min-Max: Minumum-Maximum, n: Number, %: Percentage .Values of p< 0.05 was accepted as significant and marked bold. * Kruskal Wallis Tert, # Fischer's exacttest. a,b,c; For the median values specified with indices such as a, b, and c, those with the same index are the same, others are different, statistically

(32.6%) and followed by universities and professional organizations (21.4%). However, misleading videos were mainly created by other media users (55.8%). The most targeted audience in the useful videos were patients (47.9%) and healthcare professionals (38.7%), respectively. The misleading videos targeted patients (82.3%) predominantly. The main presenters were physicians (53% vs 29.4%, p=0.001) in the useful videos, whereas individual users were the main presenters (35.2% vs 3%, p<0.001) in the misleading videos. The content, source, and target audience analysis of videos are summarized in Table 2.

Videos created by medical advertising/for-profit companies had the highest average number of views, likes, and comments, while these parameters were lowest for videos posted by universities/professional organisations, health information websites, and non-profit doctors/non-profit healthcare providers. The median video length was significantly higher in videos uploaded by universities/professional organizations than those from all remaining video sources (p<0.001). Videos uploaded by universities/professional organizations had higher modified DISCERN and GQS scores than those from all other video sources, with statistical significance (p<0.05). Alternative treatment-related information was higher in the medical advertisement/for profit companies and other media groups (p<0.05). Videos including medical product advertisements were mostly uploaded by medical advertisement/for profit companies (p=0.034). A detailed analysis of video characteristics by the source of upload is given in Table 3.

DISCUSSION AND CONCLUSION

YouTube is a popular website with over 1.9 billion monthly visitors searching for health-education videos (16). Recently, people from all over the world watch

and interact with online content for most of the day (16). Therefore, an incredible amount of medical information is presented to patients seeking health issues. This resource is also used by health professionals not only to inform people but also to increase the professional education of physicians and healthcare providers. Hence, the effective and proper use of this resource can lead to a healthier life and improvement in health outcomes.

Data from the European Action on Secondary and Primary Prevention by Intervention to Reduce Events (EUROASPIRE III) survey showed that 46.2% of patients with hypercholesterolemia failed to reach their target LDL-C level in Europe (17). Patients' medical behavior is a well-known factor in achieving clinical goals. Indeed, the perception of a lack of illness and belief in medication effectiveness is a commonly reported barrier to patient compliance (18). Therefore, accurate online medical information can lead to improvements in treatment reliance, proper medical behavior, and treatment motivation. Additionally, 75% of patients with chronic health problems stated that recent online research on health issues influenced their treatment decisions (19). Therefore, physicians and healthcare providers should play an active role in providing accurate quality videos for patients.

We investigated YouTube videos regarding hypercholesterolemia with a total duration of 37.6 h. The total number of views is more than three hundred thousand, which means that hypercholesterolemia is popular on YouTube. Of these, 74.2% included scientifically correct information and 25.8% were misleading. Useful videos had the best content on epidemiology, pathogenesis, risk assessment and complications, preventions/lifestyle modifications, and pharmacologic treatment of hypercholesterolemia. Furthermore, the useful information group had a higher DISCERN and GQS score than the misleading group, which demonstrates that useful videos are more reliable and have better quality. However, the number of total and/or daily views, comments, and likes was consistently lower for useful videos compared with the misleading group. These findings reveal that people who seek answers to their health problems are often exposed to misleading information regarding hypercholesterolemia.

Considerable heterogeneity exists in the proportions of useful videos evaluating medical information on YouTube. Similar to our results, 54% of YouTube videos concerning rheumatoid arthritis were useful (8), 62% of videos on heart transplantation (20), and 61% of videos on the 2009 H1N1 pandemic were useful (21). Contrarily, in a study that evaluated YouTube videos regarding movement diseases like dystonia and Parkinson's disease, 66% of videos contained misinformation such that these diseases are psychological rather than real movement disorders (22). For this reason, nearly half of health seekers have concerns about the reliability of online medical information (12). Therefore, many health seekers believe that healthcare professionals should evaluate internet sites for accuracy and guide patients regarding easy-to-read internet websites (12).

Approximately one-third of the videos included in our study contained misleading information. These videos often highlighted holistic health, homemade natural cures, diet regimens, and herbal products with unknown credentials. The most common homemade cures were recipes incorporating vegetables/fruits or their mixtures such as garlic, ginger, cinnamon, asparagus, flaxseed, soy, guggul, and almond. Although modest short-term improvements in lipid measures were detected with these products (23), effects on cardiovascular outcomes were either not measured or not confirmed. These recommendations usually originate from videos posted by medical advertisements/for-profit companies or individual users. Furthermore, different diets have been offered for hypercholesterolemia treatment. One of the popular offered dietary regimes was ketogenic, which mainly restricts carbohydrates and incorporates moderate levels of protein (approximately 10% of calories) with no restriction of fat (70-80% of calories). There are many controversies about the long-term safety of these diets, so low-carb diets are considered unsafe and should be avoided according to current guidelines (24). Many misleading videos included promotions about alternative treatments, which can be easily purchased online and threaten patient safety. Although there is limited data on alternative treatments available from the internet, there have been several reports of multiple organ failure and death associated with supplements acquired

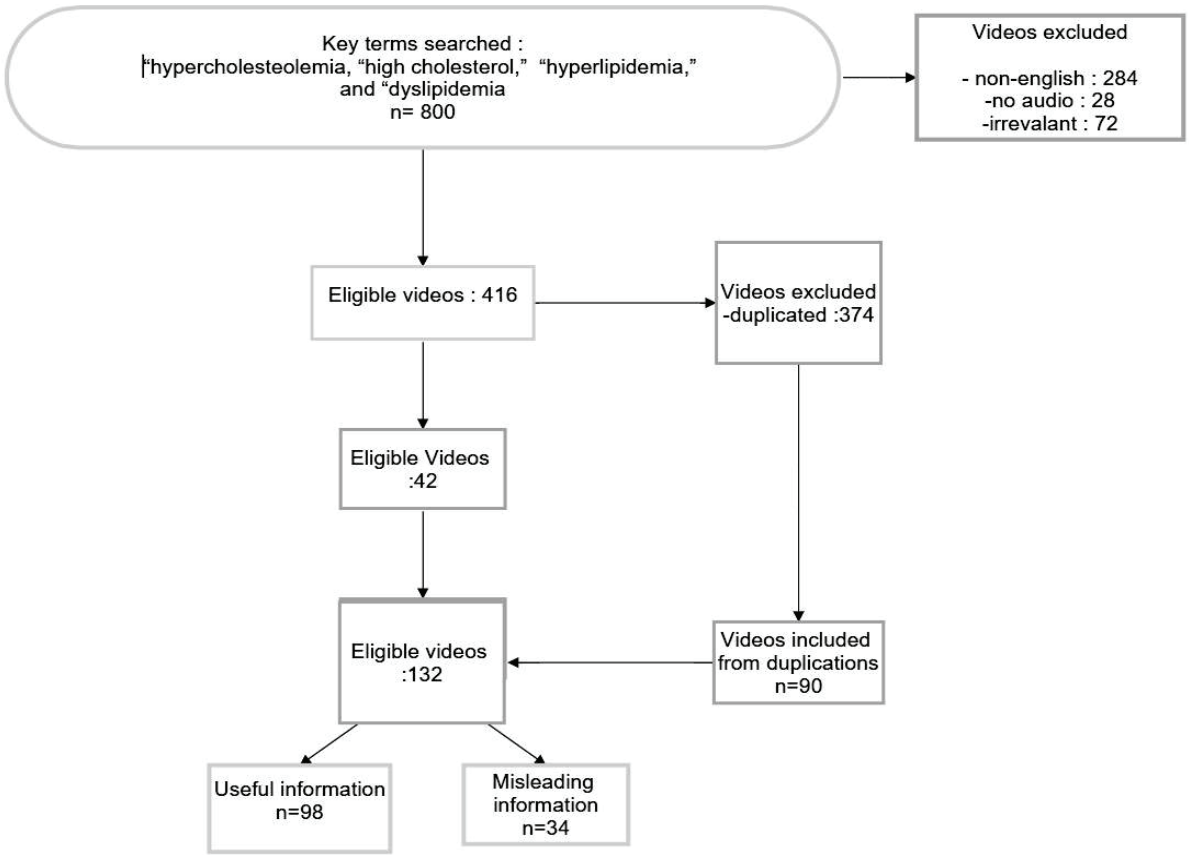

Figure 1. Selection of appropriate YouTube videos for the study.

online because of online medical misinformation (25). The recommendations associated with herbal products commonly have arisen from Asian-based narrators.

The misleading videos also delivered scientifically unconfirmed and potentially dangerous information for hypercholesterolemia, such as 'There is no relation between LDL-C levels and heart attacks'. The perception of hypercholesterolemia varies according to the education of the patients. As the level of education increases, the idea that cholesterol drugs are harmful also increases. This can be explained by the fact that there was more medical misinformation that appeared to be "real" on the internet (26). Physicians and healthcare providers must inform patients concerning medical misinformation available on the internet and recommend accurate sources to get online medical information via professional societies such as the European Society of Cardiology Patient Websites (27). We believe that the medical community should be aware of medical misinformation problems, which can affect patients' behavior and attitude.

We would also like to pay attention to another point. Although videos provided by physicians and professional organizations are considered more reliable and accurate, they have the lowest viewing rates. Personal experiences and profit company-created videos displayed the highest view ratios. Similarly, these videos usually were "liked" videos, and most of the comments were gathered under these "liked" videos. These findings reveal that people tended to be actively involved with peers' experiences of a disease irrespective of the credibility and source of information. Further, we found that videos posted by physicians and professional organizations were longer than other sources, which indicates that viewers are less interested in longer and more scientific videos. It is well-known that the active engagement of patients in their treatment regimen can lead to behavioral modification and improve treatment success. We, therefore, think that professional health committees should upload simple and short videos primarily targeting patients on YouTube.

The study should be evaluated in light of some limitations. First, there is no proven method in the literature for evaluating the quality standard of videos related to healthcare problems. However, in the present study, we analyzed the videos using previously established and used methods for evaluating medical YouTube videos (28). Second, a specific time frame was used for the analysis of videos. YouTube is a dynamic video-sharing platform in which video content related to hypercholesterolemia can change rapidly. Third, only English-language videos were included for analysis. Therefore, including other languages could have led to different results.

In conclusion, significant numbers of accurate videos are available on YouTube regarding hypercholesterolemia. However, these videos were less likely to interact with users compared to scientifically incorrect videos. Physicians could keep in mind the limited content of YouTube and correct any misinformation through face-to-face meetings. Additionally, physicians and other healthcare organizations could upload more accurate, less complex, and patient-specific videos.

Conflict-of-interest and financial disclosure

The authors declare that they have no conflict of interest to disclose. The authors also declare that they did not receive any financial support for the study.

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