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Evaluation of the Reliability and Quality of YouTube Videos about Insulin Injection in Children

Çocuklarda İnsülin Enjeksiyonu ile İlgili YouTube Videolarının Güvenilirliği ve Kalitesinin Değerlendirilmesi

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ABSTRACT

Aim: Social media platforms, especially YouTube, have become indispensable channels where patients apply for information on medical issues. This study aimed to evaluate the reliability and quality of videos on YouTube about insulin injection in children.
Material and Methods: The first 100 videos with the search "insulin injection in children" were analyzed. The distribution of video types, viewing rates, like ratios, number of comments, and video power indexes (VPI) were recorded. The content qualities were assessed by the global quality scale (GQS), modified DISCERN score, the Journal of the American Medical Association (JAMA) benchmark score, and the patient education materials assessment tool for audio/visual (PEMAT-A/V) materials.
Results: Forty-seven (47%) videos were analyzed finally. The median score of the GQS was 4, modified DISCERN and JAMA was 3. The median PEMAT A/V understandability and actionability scores were 84 and 75. Videos by professionals were found to have better results than the non-professional ($p<0.001$). Correlation analyses revealed positive correlations between video analytics, such as number of views, likes and comments, view rate, VPI, and content quality scales, including GQS, modified DISCERN, JAMA, and PEMAT-A/V scores ($p<0.001$).
Conclusion: Although many of the videos examined were of professional origin and their quality scores were higher, the rate of videos from non-professional origin was close to half. The quality scores of these non-professional videos were quite low in all used scales. It is important that patients and their relatives prefer videos uploaded by professional sources to access information from platforms such as YouTube.
Keywords: Diabetes mellitus; insulin injection; child; YouTube.

ÖZ

Amaç: Başta YouTube olmak üzere sosyal medya platformları, hastaların tıbbi konularda bilgi almak için başvurdukları vazgeçilmez mecralar haline gelmiştir. Bu çalışma, çocuklarda insülin enjeksiyonu ile ilgili YouTube videolarının güvenilirliğini ve kalitesini değerlendirmeyi amaçlamaktadır.
Gereç ve Yöntemler: "Çocuklarda insülin enjeksiyonu" aramasını içeren ilk 100 video analiz edilmiştir. Video türlerinin dağılımı, izlenme oranları, beğenilme oranları, yorum sayıları ve video güç endeksleri (video power index, VPI) kaydedilmiştir. İçerik kaliteleri küresel kalite ölçeği (global quality scale, GQS), modifiye DISCERN skoru, Journal of the American Medical Association (JAMA) kıyaslama skoru ve görsel/işitsel materyaller için hasta eğitim materyalleri değerlendirme aracı (patient education materials assessment tool for audio/visual, PEMAT-A/V) ile değerlendirilmiştir.
Bulgular: Çalışmada 47 (%47) video analiz edilmiştir. GQS puanı ortancası 4, modifiye edilmiş DISCERN ve JAMA 3 idi. Ortanca PEMAT A/V anlaşılabilirlik ve eyleme geçirilebilirlik puanları ise 84 ve 75 idi. Profesyoneller tarafından yüklenen videoların profesyonel olmayanlara göre daha iyi sonuçlara sahip olduğu görülmüştür ($p<0,001$). Korelasyon analizi, görüntülenme, beğeni ve yorum sayısı, görüntüleme oranı, VPI gibi video analitikleri ile GQS, modifiye DISCERN, JAMA ve PEMAT-A/V puanlarını içeren içerik kalitesi arasında pozitif korelasyonlar olduğu göstermiştir ($p<0,001$).
Sonuç: İncelenen videoların birçoğu profesyonel kaynaklı olmasına ve kalite puanları daha yüksek olmasına rağmen, profesyonel olmayan kaynaklı videoların oranının yarıya yakın olduğu gözlenmiştir. Profesyonel olmayan bu videoların kalite puanlarının da kullanılan tüm ölçeklerde oldukça düşük olduğu tespit edilmiştir. Hasta ve hasta yakınlarının YouTube gibi platformlardan bilgiye ulaşmak için profesyonel kaynaklar tarafından yüklenen videoları tercih etmeleri önemlidir.
Anahtar kelimeler: Diabetes mellitus; insülin enjeksiyonu; çocuk; YouTube.

INTRODUCTION

Globally, there are 422 million diabetes mellitus (DM) patients according to the 2017 report of the World Health Organization (1). The International Diabetes Federation also reported that there are nearly 1,11 million children and adolescents having type 1 DM with 132,600 new cases diagnosed yearly in this age group (1). The most common metabolic disease in childhood is still type 1 DM (2). Therefore, the management of type 1 DM among children and adolescents is crucial.

The gold standard way of treatment for children with type 1 DM is insulin therapy. Insulin therapy should be started immediately after the diagnosis because the child's metabolism can deteriorate rapidly (3). To prevent micro and macrovascular complications in patients, intensive insulin therapy is recommended (4). But the problem with this intensive therapy is hypoglycemia which can be a mortal complication. So, delivery of the insulin mimicking the endogenous insulin secretion by the pancreas is very important (5). Because the insulin is a peptide hormone, the gastric acid destroys it if taken orally. Also, the intradermal, intramuscular, and intravenous daily self-administrations are not suitable to control blood glucose levels. The most preferred method of insulin administration is the subcutaneous route (5). There are some limitations of this route like pain and lipodystrophy at the injection site; the compliance of the patients, especially the lower aged children, to this method can be difficult (6). Although there are some new insulin administration methods like continuous subcutaneous insulin injection with pump, nasal, or inhaled insulin therapy, the most used method of insulin delivery remains the use of insulin pens (6). Insulin pens are more effective and accurate when compared to traditional vial and syringe methods (7). While insulin pens have numerous advantages, the usage technique and adjustment of the dosage need some expertise, and children and/or their caregivers should learn these well (8). Hospitals give the necessary education about these methods with their professional teams (nurses, etc.) to the children and their families but the patients need sometimes educational videos.

Access to the internet is now easy nearly all over the world. The social media platforms are the popular sources of information about health issues. Especially the video sharing channels are preferred by most users to gain information (9). YouTube is the leading video platform on the internet according to 2023 data (10) and it is one of the most preferred sources of health information (11). While it has a lot of valuable information about health problems, there are some important concerns regarding the negative impacts. The most important one is false information and its uncontrolled spread. The misinformation about DM care given by uncontrolled data can cause serious health outcomes such as incorrect insulin injections, difficulties in DM control, and even irreversible morbidities. Therefore, the verification of the reliability and quality of the information given in these videos is essential. There are plenty of studies in the literature developing some scales and methods to evaluate the quality of medical content online (12). There is limited data in the literature about YouTube videos concerning insulin and DM (13,14). However, there is no research evaluating the videos about "insulin injection in children" on the YouTube platform. The purpose of this study was to evaluate the videos about insulin injection in children on YouTube in terms of reliability, quality, understandability, applicability, and accuracy.

MATERIAL AND METHODS

Data Collection

The video search was performed on https://youtube.com/ on August 10, 2024, using the keyword "insulin injection in children". The browser's search history and all cookies were cleared, and personal Google or YouTube accounts had not been logged in to prevent personalized results.

The default selection was set to relevance-based ranking to mimic an ordinary user. Literature has shown that; most of the users click on results within the first pages of internet search (15). Currently, results from the YouTube search engine are displayed in the form of an infinite scrolling list, not as pages. For this reason, the first 100 videos for the keyword were analyzed to have a reliable result.

Videos that were related to the subject, in English and between 1-10 minutes were included. Videos under 10 minutes and more than 1 minute have been shown to be more effective in giving information to the user (16). Videos that are shorter than 1 minute and longer than 10 minutes, not related to the subject, not in English, and duplicated and advertisement videos were excluded. The uniform resource locators (URLs) of the videos meeting the inclusion criteria were saved for further analysis.

Analysis of Videos

Information about the videos such as country of origin, source, image type (animation/real), number of views, days since publication, quality of image, number of likes and dislikes, number of comments, and video duration (in seconds) were recorded. The view rate (number of views/days since publication) and like rate (number of likes x 100 / number of likes + dislikes) were calculated and recorded. The video power index (VPI) was computed using the formula: like rate x view rate / 100.

The purposes of the videos were grouped regarding the content as, technical information about insulin injection in children, general information about DM in children, social life of the diabetic children, and dosing and calculations of insulin usage in children with DM. The uploaders of the videos were categorized into five groups: 1) healthcare professionals (HP), 2) academic health organizations (AH), 3) patient and/or their caregivers (PT), 4) TV/educational websites (TV), and 5) non-academic healthcare systems (non-AH). Videos from groups 1 and 2 were regarded as professional and the other sources as non-professional sources.

The videos were evaluated for quality, accuracy, reliability, understandability, and actionability by utilizing the modified DISCERN score, the Journal of the American Medical Association (JAMA) benchmark score, the global quality scale (GQS), and the patient education materials evaluation tool audio/visual (PEMAT-A/V).

The modified DISCERN scale has five questions for the assessment of the reliability of the information given in the video. Every question can take either 1 or 0 points; higher scores indicate increased reliability and less bias in the presented content. The scale is a reliable and valid

instrument for assessing the quality of written health information. This modified tool has been used in many studies especially to evaluate the reliability of YouTube content (17).

JAMA benchmark score is used to evaluate the quality of the given information according to authorship, citation of sources, currency, and conflict of interest. All the criteria used in this score can take 1 point; a maximum score of 4 points shows the highest level of accuracy and reliability. To ensure the veracity and integrity of online content, it is essential that website authorship is formally defined to include authors, contributors, links, and credentials. Furthermore, citations must include references and sources used for content and copyright information. In addition, disclosures should include details about sponsorship, advertising, commercial funding, and potential conflicts of interest. Finally, currency should include the date and timeliness of the information published (18).

GQS is widely used and measures the quality of the video based on usefulness. The scale enables investigators to assess the flow, ease of use, and quality of videos. A score of 4 or 5 indicates high quality, 3 indicates intermediate quality, and 1 or 2 points indicate low quality (19,20).

PEMAT-A/V was used to assess the clarity and quality of the patient education materials. The video and/or audio material was evaluated to ensure that is the information given effectively communicated to the patients in a clear, understandable, and actionable manner. The tool has 13 parts for the understandability domain (PEMAT-A/V U) and 5 parts for the actionability domain (PEMAT-A/V A). Percentages of each domain were reported in this validated instrument (21).

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics v.22.0 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). The normality assumption for continuous variables was investigated by the Shapiro-Wilk test. Descriptive statistics were presented as median, interquartile range, minimum, and maximum for continuous data, and numbers and percentages were reported for categorical data. The Mann-Whitney U test for two groups and the Kruskal-Wallis test followed by the Bonferroni corrected post hoc test for three or more groups were used to compare groups. Spearman's rho was calculated for analyzing correlations between video characteristics and quality scores. A p-value of <0.05 was considered statistically significant.

RESULTS

The first 100 videos were watched. 12 of the videos were less than 60 seconds and 6 were more than 600 seconds; 11 videos were not in English, 8 videos were the same, 10 videos were advertising, and 6 videos were not related to the subject. Finally, 53 (53%) of the videos were excluded and the remaining 47 (47%) videos were analyzed.

Thirty-eight (80.9%) of the videos were real and the remaining 9 (19.1%) were animation. 29 (61.7%) of the videos were professional. Most of the videos were about the technical information. The general characteristics of the videos was summarized in Table 1.

The median duration of the 47 videos was 315 seconds. The median time since upload was 1765 days, number of views was 44,196, the number of likes was 418, the number of dislikes was 13, the number of comments was 22, the like rate was 95, the view rate was 21.8 and VPI was 20.6. The median score of the GQS was 4, modified DISCERN was 31 and JAMA was 3. The median scores of PEMAT-A/V understandability and actionability were 84 and 75, respectively (Table 2).

The content quality of the videos was analyzed according to the source, and videos uploaded by professional (HP and AH groups) sources were found to have better content quality results than non-professional (PT, TV, and non-AH groups) ones (Tables 3 and 4). When the type of the videos was grouped as real or animation, there wasn't any statistically significant difference between them according to the content quality assessments (Table 5).

The content of the videos was grouped as technical information (T), general information (G), the social life of the child (S), and dosing calculation (D). There wasn't any statistically significant difference between them in VPI, GQS, modified DISCERN, and JAMA. The PEMAT A/V understandability scores of the T videos (p=0.005) and D videos (p=0.009) were significantly higher than the S videos. Also, the PEMAT A/V actionability scores of the T videos (p=0.007) and D videos (p=0.005) were significantly higher than the S videos (Table 6).

The image qualities of the videos were also assessed, and the videos were grouped as having standard or high definition. The content qualities of the videos according to VPI, GQS, modified DISCERN, JAMA, PEMAT-A/V U, and PEMAT-A/V A having high-definition image quality were better than the standard definition videos (p<0.001, p=0.002, p<0.001, p<0.001, p<0.001, and p<0.001, respectively, Table 7).

Table 1. Distribution of video types

	n (%)
Country	
USA	27 (57.4)
UK	9 (19.1)
Canada	4 (8.5)
Australia	2 (4.3)
India	3 (6.4)
Singapore	2 (4.3)
Source	
Healthcare professionals	17 (36.2)
Academic health organizations	12 (25.5)
Patient	8 (17.0)
TV/educational website	5 (10.6)
Non-academic healthcare systems	5 (10.6)
Professionality	
Professional	29 (61.7)
Non-professional	18 (38.3)
Type	
Real	38 (80.9)
Animation	9 (19.1)
Video Content	
Technical info	28 (59.6)
General info	9 (19.1)
Social life of a child	6 (12.8)
Dosing calculation	4 (8.5)
Image Quality	
Standard (480p)	14 (29.8)
High (≥720p)	33 (70.2)

USA: United States of America, UK: United Kingdom

Table 2. Descriptive statistics of video characteristics

	Mean±SD	Median	IQR	Min-Max
Time since upload (days)	2062.74±1294.65	1765	1150-2920	280-5020
Duration (seconds)	303.38±139.26	315	203-388	80-592
Number of views	313306.32±598189.05	44196	13191-193187	467-2474391
Number of likes	2180.68±5426.28	418	101-1018	2-33218
Number of dislikes	86.43±220.55	13	3-38	0-1255
Number of comments	254.12±763.49	22	6-161	0-4300
Like rate	92.79±9.08	95	93-98	61-100
View rate	168.77±366.18	21.8	8.1-128.2	0.5-1682.6
VPI	162.09±354.61	20.6	7.6-126.9	0.3-1665.8
GQS	3.77±1.13	4	3-5	2-5
DISCERN	3.11±1.17	3	2-4	1-5
JAMA	2.57±1.25	3	1-4	0-4
PEMAT A/V U	69.85±26.22	84	44-92	20-100
PEMAT A/V A	58.62±36.40	75	33-100	0-100

VPI: video power index, GQS: global quality scale, JAMA: Journal of the American Medical Association, PEMAT-A/V: patient education materials assessment tool audio/visual, U: understandability, A: actionability, SD: standard deviation, IQR: interquartile range (25^{th}-75^{th} percentile)

Table 3. Analyses of content quality of videos by source

	Health Professionals (HP)	Academic Health Organizations (AH)	Patient and/or their caregivers (PT)	TV/Educational Website (TV)	Non-Academic Healthcare Systems (non-AH)	p
	Median (IQR) [min-max]	Median (IQR) [min-max]	Median (IQR) [min-max]	Median (IQR) [min-max]	Median (IQR) [min-max]	
VPI	110.9 (20.9-354.8) [0.4-1665.8]	19.4 (10.6-122.4) [1.2-1433.3]	6.9 (1.4-20.2) [0.3-52.8]	1.4 (0.9-43.5) [0.7-75.1]	36.3 (19.4-93.0) [19.2-126.9]	**0.011**
GQS	5 (4-5) [2-5]	4 (4-5) [3-5]	2.5 (2-3.75) [2-4]	3 (2-3.5) [2-4]	4 (2.5-4.5) [2-5]	**0.003**
DISCERN	4 (3.5-4) [1-5]	4 (3-4.75) [2-5]	2 (1.25-2.75) [1-3]	2 (1.5-2.5) [1-3]	3 (2-3) [2-3]	**<0.001**
JAMA	4 (2.5-4) [0-4]	3 (3-4) [1-4]	1 (1-1.75) [1-3]	2 (1-2) [1-2]	2 (1.5-3) [1-3]	**0.002**
PEMAT A/V U	92 (83.5-96) [27-100]	89.5 (84-91.75 [72-100]	38 (23.25-52.25) [22-55]	40 (26.5-53.5) [20-63]	63 (49.5-79.5) [45-90]	**<0.001**
PEMAT A/V A	100 (75-100) [0-100]	75 (75-100) [50-100]	25 (6.25-33) [0-33]	0 (0-29) [0-33]	33 (33-75) [33-100]	**<0.001**

VPI: video power index, GQS: global quality scale, JAMA: Journal of the American Medical Association, PEMAT-A/V: patient education materials assessment tool audio/visual, U: understandability, A: actionability, IQR: interquartile range (25^{th}-75^{th} percentile), post hoc test results of groups; VPI: HP vs PT: p=0.002, HP vs TV: p=0.009; GQS: HP vs PT: p=0.002, HP vs TV: p=0.012, AH vs PT: p=0.003, AH vs TV: p=0.012; DISCERN: HP vs PT: p=0.001, HP vs TV: p=0.004, HP vs Non-AH: p=0.050, AH vs PT: p=0.001, AH vs TV: p=0.005; JAMA: HP vs PT: p=0.001, HP vs TV: p=0.013, AH vs PT: p=0.002, AH vs TV: p=0.019; PEMAT A/V U: HP vs PT: p<0.001, HP vs TV: p=0.001, AH vs PT: p<0.001, AH vs TV: p=0.003; PEMAT A/V A: HP vs PT: p<0.001, HP vs TV: p=0.001, AH vs PT: p=0.001, AH vs TV: p=0.001

Table 4. Content quality of videos by professionality

	Professionals	Non-professionals	p
	Median (IQR) [min-max]	Median (IQR) [min-max]	
VPI	57.2 (14.2-322.6) [0.4-1665.8]	15.5 (1.3-40.4) [0.3-126.9]	**0.008**
GQS	4 (4-5) [2-5]	3 (2-4) [2-5]	**<0.001**
DISCERN	4 (3-4) [1-5]	2 (2-3) [1-3]	**<0.001**
JAMA	4 (3-4) [0-4]	1.5 (1-2) [1-3]	**<0.001**
PEMAT A/V U	91 (84-92) [27-100]	44 (31.5-57) [20-90]	**<0.001**
PEMAT A/V A	75 (75-100) [0-100]	29 (0-33) [0-100]	**<0.001**

VPI: video power index, GQS: global quality scale, JAMA: Journal of the American Medical Association, PEMAT-A/V: patient education materials assessment tool audio/visual, U: understandability, A: actionability, IQR: interquartile range (25^{th}-75^{th} percentile)

Table 5. Content quality of videos by type

	Real	Animation	p
	Median (IQR) [min-max]	Median (IQR) [min-max]	
VPI	23.6 (9.8-154.6) [0.4-1433.3]	19.2 (2.5-42.9) [0.3-1665.8]	0.262
GQS	4 (3-5) [2-5]	5 (2.5-5) [2-5]	0.351
DISCERN	3 (2-4) [1-5]	3 (2-5) [1-5]	0.548
JAMA	3 (1-4) [0-4]	3 (1.5-4) [1-4]	0.393
PEMAT A/V U	84 (44-92) [20-100]	83 (47-90) [27-100]	0.871
PEMAT A/V A	75 (31-100) [0-100]	75 (16.5-100) [0-100]	0.879

VPI: video power index, GQS: global quality scale, JAMA: Journal of the American Medical Association, PEMAT-A/V: patient education materials assessment tool audio/visual, U: understandability, A: actionability, IQR: interquartile range (25^{th}-75^{th} percentile)

Table 6. Analyses of content quality of videos by content

	Technical Info (T)	General Info (G)	Social Life of a Child (S)	Dosing Calculation (D)	p
	Median (IQR) [min-max]	Median (IQR) [min-max]	Median (IQR) [min-max]	Median (IQR) [min-max]	
VPI	58.2 (6.2-317.9) [0.5-1665.8]	19.1 (11.7-50.4) [0.4-1163.4]	10.4 (0.6-24.5) [0.3-36.3]	22.5 (19.6-114.4) [19.5-144.1]	0.197
GQS	4 (3-5) [2-5]	4 (2.5-4.5) [2-5]	2 (2-3.5) [2-5]	4 (4-4.75) [4-5]	0.114
DISCERN	3 (2-4) [1-5]	3 (2-4) [2-4]	2 (1-3) [1-3]	4 (3.25-4.75) [3-5]	0.050
JAMA	3 (1.25-4) [1-4]	3 (1.5-3.5) [0-4]	1 (1-2.25) [1-3]	3.5 (3-4) [3-4]	0.076
PEMAT A/V U	87 (54-92) [22-100]	83 (49.5-90) [36-92]	38.5 (25.25-49.5) [20-63]	90.5 (88.5-91.75) [88-92]	**0.024**
PEMAT A/V A	75 (33-100) [0-100]	75 (29-75) [0-100]	16.5 (0-33) [0-33]	87.5 (75-100) [75-100]	**0.019**

GQS: global quality scale, JAMA: Journal of the American Medical Association, PEMAT-A/V: patient education materials assessment tool audio/visual, U: understandability, A: actionability, VPI: video power index, IQR: interquartile range (25^{th}-75^{th} percentile), post hoc test results of groups; PEMAT A/V U: T vs S: p=0.005, S vs D: p=0.009; PEMAT A/V A: T vs S: p=0.007, S vs D: p=0.005

Correlation analyses revealed positive correlations between video analytics, such as number of views, likes, dislikes, comments, and view rate, VPI, and content quality scales, including GQS, modified DISCERN, JAMA, and PEMAT-A/V U and A scores (Table 8).

Table 7. Content quality of videos by image quality

	Standard (480p)	High (≥720p)	p
	Median (IQR) [min-max]	Median (IQR) [min-max]	
VPI	6.9 (0.9-19.1) [0.3-59.1]	57.2 (19.4-316.7) [0.7-1665.8]	**<0.001**
GQS	2.5 (2-4) [2-5]	4 (4-5) [2-5]	**0.002**
DISCERN	2 (1.75-2.25) [1-4]	4 (3-4) [1-5]	**<0.001**
JAMA	1 (1-2) [0-4]	3 (2-4) [1-4]	**<0.001**
PEMAT A/V U	38 (27-64.5) [22-91]	90 (63.5-92) [20-100]	**<0.001**
PEMAT A/V A	25 (0-37.25) [0-75]	75 (49.5-100) [0-100]	**<0.001**

VPI: video power index, GQS: global quality scale, JAMA: Journal of the American Medical Association, PEMAT-A/V: patient education materials assessment tool audio/visual, U: understandability, A: actionability, IQR: interquartile range (25^{th}-75^{th} percentile)

DISCUSSION

This study evaluated the quality and usefulness of the YouTube videos about "insulin injection in children" focusing on the first 100 videos related to the subject. In general, the evaluated 47 videos exhibit medium quality using the GQS, modified DISCERN, JAMA, and PEMAT A/V understandability and actionability scales. The quality of the content of the videos uploaded by the professional sources was better than the non-professional ones according to all used scales. While there are some studies in the literature evaluating the online contents related to DM, insulin injection, and resistance (13,14,22-24), this study is the first to specifically analyze the utility of YouTube videos on the subject of insulin injection in children.

Diabetes mellitus is a complex problem and the patient, whether a child or adolescent, should be informed about the course and treatment of the disease. The most common metabolic disorder in all over the world is still type 1 DM and insulin therapy is the mainstay of the management of this condition (25). Education of the children with type 1 DM is very important in the management. One of the musts that a child with type 1 DM should learn is the insulin injection technique (26). The technique should be explained well to the child and his/her family, and the initial applications should be carried out under the supervision of a professional team. However, it is also obvious that information materials will be needed so that the child and his/her family will not have difficulties when applying this treatment in their own lives. YouTube

Table 8. Correlation coefficients between content quality scores and video analytics

	GQS		DISCERN		JAMA		PEMAT-A/V U		PEMAT-A/V A	
	r_s	p	r_s	p	r_s	p	r_s	p	r_s	p
Time since upload	-0.008	0.960	-0.143	0.339	-0.001	0.996	-0.053	0.722	0.037	0.804
Video duration	-0.065	0.663	0.054	0.720	-0.014	0.927	-0.008	0.957	-0.008	0.957
Number of views	0.616	**<0.001**	0.635	**<0.001**	0.637	**<0.001**	0.727	**<0.001**	0.695	**<0.001**
Number of likes	0.562	**<0.001**	0.648	**<0.001**	0.643	**<0.001**	0.727	**<0.001**	0.720	**<0.001**
Number of dislikes	0.320	**0.028**	0.415	**0.004**	0.427	**0.003**	0.455	**0.001**	0.432	**0.002**
Number of comments	0.458	**0.003**	0.585	**<0.001**	0.542	**<0.001**	0.689	**<0.001**	0.641	**<0.001**
Like rate	0.275	0.062	0.270	0.066	0.244	0.099	0.324	**0.026**	0.353	**0.015**
View rate	0.643	**<0.001**	0.716	**<0.001**	0.675	**<0.001**	0.761	**<0.001**	0.730	**<0.001**
VPI	0.653	**<0.001**	0.727	**<0.001**	0.689	**<0.001**	0.771	**<0.001**	0.744	**<0.001**

GQS: global quality scale, JAMA: Journal of the American Medical Association, PEMAT-A/V: patient education materials assessment tool audio/visual, U: understandability, A: actionability, VPI: video power index, r_s: Spearman's rho

has significant potential as a health education tool, as video-assisted learning has been shown to be valuable for patients' knowledge acquisition (27). It should be kept in mind that uncontrolled and easily accessible online information may cause serious problems in the diagnosis and treatment of some diseases. At this point, it is important that the information provided on YouTube is also examined by professionals in the field and that patients are guided in line with the results obtained (9,11,20).

Evaluation and standardization of the quality and reliability of health-related content can be achieved by using appropriate quality assessment scales. The most frequently used scales for this purpose include GQS, modified DISCERN, and JAMA (9,11,20). In addition to these commonly used scales, the PEMAT A/V was used in this study. While the use of educational materials such as videos is increasing, scales specifically developed to evaluate them are limited. The PEMAT A/V has been shown to be superior to other quality assessment tools in its ability to reliably assess video or audio materials. In addition, PEMAT A/V is the first tool to measure actionability, an increasingly desirable goal of patient education materials. Although the use of PEMAT A/V in such studies complicates the study process, it increases the reliability of the results (21). It should be noted that the actionability scores of the videos analyzed in this study were lower than the understandability scores. It is possible to say that the quality of educational videos related to insulin injection in children will increase significantly with the development of video content having high actionability scores.

Videos about health information on YouTube generally show medium or low quality. In a study evaluating the reliability of YouTube videos about health-related information, the quality of the contents was found to be average-low according to modified DISCERN and GQS scales (11). In a recent study evaluating the insulin pen injection videos on YouTube as a patient education resource, they found reliable results, but nearly half of the videos were misleading (14). Barlas et al. (13) evaluated the YouTube videos about insulin resistance recently and they also found that 54% of the videos had very poor quality. Sixty-two YouTube videos about DM were evaluated by Mylavarapu et al. (24) and they found average results of GQS and reliability scores. In this study, the mean scores were found to be consistent with the literature in all the data obtained from the GQS, modified DISCERN, JAMA, and two forms of the PEMAT A/V scales.

When we look at the results of this study, one can see that videos with high educational quality have more views. However, the view rate or VPI may not always indicate that the video is quality and reliable. Scales such as the GQS, modified DISCERN, JAMA, and PEMAT A/V scores assess specific content quality elements, but the VPI indicates the perceived value of video content. Some studies on medical videos have shown that videos that are popular among viewers may lack content quality (9,28). To increase the view rate of informative content about insulin injection in children by the target audience, it is valuable to create a video format that considers the standards set by quality scales.

Educational videos uploaded by professionals had higher quality and reliability than those of non-professionals in most of the studies (29-31). However, some studies have reported contrary results (13). In this study, it was found that videos uploaded from professional sources have higher quality rates than non-professional sources according to all quality scales used.

In further evaluation, video analytics such as number of views, likes, dislikes, comments, view rate, VPI, and used content quality scales showed a positive correlation. This result is consistent with the studies in the literature (32,33). In light of these results, we can say that patients and/or their relatives can understand quality and reliable information and determine their preferences accordingly. Standardization of the videos uploaded to the YouTube platform in the field of health can be effective in improving quality. For example, the inclusion of certain criteria to improve quality, such as indicating the source of information and indicating areas of uncertainty before videos are presented to internet users, may contribute positively to health accreditation.

This study is not free from some limitations. First, only videos published in English were examined, which prevents the generalization of the study results. Secondly, although the aim was to identify the most relevant videos, being stuck with a single keyword for video selection could be seen as a limiting factor. Furthermore, focusing only on videos published on the YouTube platform and excluding content from other websites and social media platforms may not cover all the information available on insulin injection in children on online platforms.

CONCLUSION

This study is the first to analyze YouTube videos about insulin injection in children specifically. Although many of the videos examined were of professional origin and their quality scores were higher, the rate of the videos of non-professional origin was close to half. Unfortunately, the quality scores of these videos were quite low in all used scales. It is important that patients and their relatives are not prevented from accessing information from platforms such as YouTube, but rather are guided correctly by health professionals.

Ethics Committee Approval: Since our study was not an experimental study including human or animal subject, ethics committee approval was not required.

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