ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

DOI: 10.5336/urology.2023-95752

The Reliability of Videos About Transdermal Testosterone Therapy on YouTube: Cross-Sectional Study

Transdermal Testosteron Terapisi Hakkında YouTube'daki Videoların Güvenilirliği: Kesitsel Çalışma

Emin Taha KESKİN[a], Harun ÖZDEMİR[a]

[a]Clinic of Urology, Başakşehir Çam and Sakura State Hospital, İstanbul, Türkiye

ABSTRACT Objective: To compare the quality and reliability of YouTube videos (YTVs) about transdermal testosterone (TT) uploaded by physicians and non-physicians. **Material and Methods**: In this cross-sectional study, "Transdermal testosterone", "TESTOGEL", "AndroGel", "Testim" and "Testosterone Cream" terms were searched on YouTube. The most related 94 videos were used for statistical analysis. All videos were divided into 2 categories based on the uploaders: physicians and non-physicians. Videos' length, view counts, date of uploading, number of comments, like counts were recorded. Global Quality Scale (GQS), Quality Criteria for Consumer Health Information (DISCERN) and The Journal of the American Medical Association (JAMA) scores were used to evaluate the quality, reliability and content of each YTV. In all scoring tests, a high score indicates high quality videos. **Results:** 53% of the analyzed YTVs related TT were uploaded by physicians. There was no significant difference between video uploaders (physicians and non-physicians group) in video duration (p=0.099), time since upload (p=0.557), total view count (p=0.952), dailly view ratio (p=0.850), number of commends (p=0.127) and likes (p=0.606). The mean GQS, DISCERN, and JAMA scores for YTV uploaded by physicians were higher than those of non-physicians (3.8, 56, 2.56, and 1.68, respectively; 29.4, 1.18, respectively). Longer video duration was associated with higher quality videos only in the physicians group, not in the non-physicians group (p<=0.001). A positive correlation was found between the duration of the videos and quality scores (GQS, DISCERN and JAMA) in only physicians group (p=<0.001). **Conclusion:** All health professionals and physicians should be aware of the importance of testosterone related information on YouTube. Most YTVs don't have enough true information about testosterone. They should upload high-quality content videos to YouTube to prevent misinformation pollution and testosterone misuse.

Keywords: Instructional film and video; testosterone; transdermal administration

ÖZET Amaç: Bu çalışmanın amacı, hekimler ve hekim olmayanlar tarafından yüklenen transdermal testosteron (TT) ile ilgili YouTube videolarının (YTV) kalite ve güvenilirliğini karşılaştırmaktır. **Gereç ve Yöntemler:** "Transdermal testosteron", "TESTOGEL", "AndroGel", "Testim" ve "Testosterone Cream" terimleri bu kesitsel çalışmada YouTube'da aratıldı. En ilgili 94 video istatistiksel analiz için kullanıldı. Tüm videolar yükleyenlere göre 2 kategoriye ayrıldı; hekimler ve hekim olmayanlar. Videoların uzunluğu, izlenme sayıları, yükleme tarihi, yorum sayısı, beğeni sayıları kaydedildi. Her bir YTV'nin kalitesini, güvenilirliğini ve içeriğini değerlendirmek için "Global Quality Scale (GQS), Quality Criteria for Consumer Health Information (DISCERN) and The Journal of the American Medical Association (JAMA)" puanları kullanıldı. **Bulgular:** TT ile ilgili analiz edilen YTV'lerin %53'ü hekimler tarafından yüklenmiştir. Gruplar (hekim ve hekim olmayan) arasında video süresi (p=0,099), yüklemeden bu yana geçen süre (p=0,557), toplam izlenme sayısı (p=0,952), günlük izlenme oranı (p=0,850), yorum sayısı (p=0,127) ve beğeni sayısı (p=0,606) açısından anlamlı bir fark yoktu. Hekimlerin yüklediği YTV için ortalama GQS, DISCERN ve JAMA puanları hekim olmayanlara göre daha yüksekti (grupların sırasıyla 3,8, 56, 2,56; ve 1,68, 29,4, 1,18). Daha uzun video süresi, yalnızca hekimlerde daha yüksek kaliteli videolarla ilişkili olduğu gösterildi. Sadece hekimlerin yayınladığı videolarda video süresi ile videoların kalitesi (GQS, DISCERN ve JAMA) arasında pozitif korelasyon olduğu gösterild (p<0,001). **Sonuç:** Tüm sağlık profesyonelleri ve hekimler YouTube'daki testosteron ile ilgili bilgilerin öneminin farkında olmalıdır. Çoğu YTV testosteron hakkında yeterince doğru bilgi içermemektedir. Yanlış bilgi kirliliğini ve testosteronun kötüye kullanılmasını önlemek için YouTube'a kaliteli içerikli videolar yüklemelidirler.

Anahtar Kelimeler: Eğitici film ve video; testosteron; transdermal ilaç uygulaması

Testosterone is defined as a male sex hormone. It is known that testosterone is related to body composition, sexual and cognitive function. Low serum testosterone levels, which are defined as "testosterone deficiency (TD)", can cause several clinical symptoms such as decreased sexual functions and libido,

Correspondence: Emin Taha KESKİN
Clinic of Urology, Başakşehir Çam and Sakura State Hospital, İstanbul, Türkiye
E-mail: emintaha90@hotmail.com

Peer review under responsibility of Journal of Reconstructive Urology.

Received: 27 Jan 2023 ***Accepted:*** 07 Mar 2023 ***Available online:*** 08 Mar 2023

depressed mood and cognitive functions, and loss of muscle mass.[1]

The prevalence of TD ranges from 10-40% in the global.[2] The treatment of TD is testosterone therapy (TT). Different testosterone preparations with varied administration methods are available. Transdermal testosterone formulations are becoming more popular among parenteral way due to their ease of administration, simple dosage titration, and acceptable efficacy and safety.[3]

The use of testosterone preparations has increased threefold in the last 10 years, particularly in eugonadal men, which is concerning.[4] Most people use the internet to get information about all kinds of medical conditions. There is a growing quantity of easily accessible medical information on social media. YouTube (http://www.youtube.com, Google LLC, California, United States) is one type of social media on the internet that can be accessed by adults and patients. Men, in particular, who have sexual symptoms, may use the internet more frequently before visiting a urologist. However, there is not any data about the reliability of YouTube videos (YTVs) related to using transdermal TT, which is the easiest way to administer this form of TT.[5]

The aim of this study was to analysis the quality and reliability of YVTs related to transdermal TT, as well as to compare the quality differences between physicians and non-physicians uploaders.

MATERIAL AND METHODS

Our study was designed as a cross-sectional study. "Transdermal testosterone", "TESTOGEL", "AndroGel", "Testim" and "Testosterone Cream" terms were used to search on YouTube. For each term, the 30 most relevant videos were listed, for a total of 150 videos. Non-English and repeated videos were excluded from the analysis. After the exclusion of 56 videos, the remaining 94 videos were used for statistical analysis. Approval of the ethics committee was not required for this study because human or animal subjects were not included and the videos were open to public access.

Based on the uploaders, YTVs were classified into 2 distinct categories: physicians and non-physicians. The videos uploaded by physicians (such as medical doctors, urologists, or endocrinologists) are included in the physician group. Professional medical conversations, organizations' videos, and universities' professional educational videos that give information from a physician are also included in the physician group. YouTubers (such as fitness coaches) and patients (such as those with diagnosed hypogonadism and transgenders) are included in the non-physician group.

Videos' date of release, duration length, count of views, likes, and comments counts were recorded. Daily view count was calculated and recoreded using the this formulation: total view counts of video/(number of the days between reviewing date and uploading date).

Global Quality Scale (GQS) is one of the quality analysis scales used for all kinds of videos. To evaluate the video's usability and quality, a 5-point scale (1-5) is used for GQS. According to this scale, 1-2 means low quality, 3 means medium quality, and 4-5 means high quality videos.[6]

Quality Criteria for Consumer Health Information (DISCERN) is another scoring system we used to evaluate the reliability of information about transdermal TT. The DISCERN is a scoring system that consists of 15 questions intended to evaluate the quality of health-related content. Each question has a value between 1 and 5 points. Questions 1-8 are used to assess reliability, questions 9-15 are used to assess treatment choice quality, and question 16 is used to assess the overall quality of the content in the videos. Very poor video quality is categorized as 28 points, poor as 28 to 38 points, average as 39 to 50 points, good as 51 to 62 points, and excellent as 63 to 75 points.[7]

The Journal of the American Medical Association (JAMA) benchmark criterion is an alternative rating system used to assess the quality of internet data. Authorship (authors with affiliations and relevant certification), attribution (all copyright data made clear, citations in all material identified clearly), disclosure (video authority, conflict of interest, financial support, and adverts are reported), and currency (uploaded and revised time are demonstrated) are the 4 criteria used. Each criterion is worth 1 point, with a total score of 4.[8]

In this study, the SPSS 22.0 (SPSS, IBM Inc, USA) program was utilized to assess the information. Results were recorded as maximum and minimum values, mean and standard deviation for variables with continuous values, and categorical variables were recorded as percentage and number. The Kolmogorov-Smirnov test was performed to determine the variables' normal distribution. The independent samples t-test was used to determine the normal distribution of the variables. Since there was a non-normal distribution of the data, the Mann-Whitney U test was utilized for the analysis. The Pearson correlation test was performed for correlation analysis. Value of $p<0.05$ was considered all statistically significant.

RESULTS

Ninety-four YTVs were used for statistical analysis. Table 1 shows the YTVs' various characteristics. Information of the transdermal testosterone was given from directly physicians at 50 of 94 (53%) videos. There was no significant difference in video duration (p=0.099), time since upload (p=0.557), total view count (p=0.952), dailly view ratio (p=0.850), number of commends (p=0.127) and likes (p=0.606) between the physician and non-physician groups.

The mean JAMA score was calculated 1.9, the mean GQS score was calculated 2.85 and the mean DISCERN-total point was calculated 43.6 for all videos. According to DISCERN, 22.3% were "very poor", 20.2% were poor, 18.1% were "average", 21.3% were "good" and 18.1% were "excellent". JAMA, GQS and DISCERN points of videos that were submitted by physicians were showed significantly higher scores (p<0.001). All of the classified "excellent" videos were uploaded for academic education by physicians. All DISCERN subscores (reliability, treatment choice quality, and quality) submitted by physicians were significantly higher scores than those submitted by non-physicians (Table 2). The duration of videos uploaded by physi-

TABLE 1: Characteristics of the YouTube videos.

	Total n (%) 94 (100)		Physicians n (%) 50 (53)		Non-physicians n (%) 44 (47)		
	X̄±SD	Minimum-maximum	X̄±SD	Minimum-maximum	X̄±SD	Minimum-maximum	p value
Duration (minutes)	9.77±12.1	1-63	13.3±15.5	1-63	5.7±3.8	1-22	0.099*
Time since upload (day)	1396±1051	66-4490	1358.9±1059	66-4177	1438±1053	144-4490	0.557*
Number of views	27865±75615	21-649344	31880±94510	21-649344	23303±46340	272-229331	0.952*
Daily view ratio	28.8±77.1	0-623.2	34±95	0-623	22.9±50.1	0.2-283	0.850*
Number of comments	86.3±218.2	0-1724	86±251	0-1724	86.5±176.1	0-866	0.127*
Number of likes	551.5±2093	0-16000	427±1690	0-12000	693±2486	0-16000	0.606*

*Mann-Whitney U; SD: Standard deviation.

TABLE 2: JAMA, GQS and DISCERN scores.

	Total n (%) 94 (100)		Physicians n (%) 50 (53)		Non-physicians n (%) 44 (47)		
	X̄±SD	Minimum-maximum	X̄±SD	Minimum-maximum	X̄±SD	Minimum-maximum	p value
JAMA	1.9±0.9	1-4	2.56±0.7	1-4	1.18±0.3	1-2	<0.001*
GQS	2.85±1.37	1-5	3.8±0.8	2-5	1.68±0.7	1-3	<0.001*
DISCERN							
Reliability	21.8±9.6	8-38	29.1±5.5	15-38	13.5±5.6	8-30	<0.001*
Treatment	21.6±7.1	7-34	26.7±4.6	15-34	15.8±4.8	7-30	<0.001**
Quality	2.6±1.2	1-5	3.44±0.8	2-5	1.64±0.7	1-3	<0.001*
Total	43.6±16.2	16-72	56±9.6	30-72	29.4±8.8	16-60	<0.001*

*Mann-Whitney U; **Independent samples t-test; JAMA: The Journal of the American Medical Association Criterias Score; GQS: Global Quality Scale Score; DISCERN: Quality Criteria for Consumer Health Information Score; SD: Standard deviation.

cians had a significant positive correlation with the DISCERN-total, JAMA and GQS scores (r=0.471, 0.507, and 0.434, respectively) (p<0.001). This correlation was not found in the non-physicians' group. Between the 2 groups, no significant correlation was found in the time since upload, total view count, daily view ratio, number of commends, likes and JAMA, GQS, DISCERN-total scores.

DISCUSSION

This study is the first study to evaluate whether there is reliable data on YouTube according to transdermal testosterone. We aimed to evaluate the reliability of YTVs related to transdermal testosterone.

It has been demonstrated in the current literature that YTVs uploaded by physicians are significantly more reliable than those uploaded by non-physicians. Moreover, in order to use YTVs as a resource for patient education, most of the videos prepared and uploaded by a physician were acceptable quality. Most videos uploaded by non-physicians were found to be unreliable and unacceptable, as expected. Similarly, in this study, we found that there were significant differences in video quality between physicians' and non-physicians' videos.[9]

Several studies have been published to analyze the reliability and quality of YTVs related to andrological problems such as male infertility, erectile dysfunction, premature ejaculation, and prostatic diseases (such as benign prostatic hyperplasia and prostate cancer). According to current literature, most of the YTVs were found unsuitable for patient education.[10-13] In this study, we found similar results that most TT-related YTVs had low-quality information for patients.

Warren et al. found that informations related to TT and male hypogonadism on YouTube were unreliable, featured by non-physician. In the same study, they found that unreliable videos were viewed more than reliable videos. Similarly, non-physicians' videos are viewed more than physicians'.[14] In our study, we found a similar result that YTVs had low-quality information uploaded by non-physicians (p<0.000) and on the contrary, we didn't find a difference in view counts between physician's and non-physician's videos that included transdermal testosterone usage (p=0.952).

According to studies on YTVs as an educational tool for patients, the higher quality physician-uploaded videos were significantly less than those uploaded by others (health coaches, patients).[12,15,16] Conversely, in this study, physician's videos view counts were found much more than others. This was thought to be due to the fact that transdermal testosterone is a more specific issue than other general topics (such as male health, benign prostatic hyperplasia, and premature ejaculation). Urological organizations can be beneficial to patients by increasing the content of high quality videos. It will be useful for patients if associations of physicians create more educational videos for patients and publish them on the YouTube platform. This could provide a free, high-quality educational resource for both patients and clinicians on YouTube.

Ozsoy-Unubol et al. demonstrated that longer video duration is associated with higher video quality.[16] Similarly, we showed that the length of the videos was positively correlated with quality scoring systems (such as DISCERN, GQS, and JAMA). The YVTs prepared for an academic purpose were much longer than other videos. This positive correlation was thought to be caused by academic videos prepared for specialists (such as urologists, endocrinologists, and medical students).

Numerous testosterone formulations are available for the treatment of TD, with different routes of administration. Testosterone gel or cream forms are favored over other preparations (such as injectable forms) due to their easy-to-use and easy-to-dose titration, good efficacy, and good tolerability profiles. Because of these benefits, the prescribing frequency of the transdermal TT is increasing. The use of testosterone by eugonadal people, apart from hypogonadism patients, for sporting purposes has been increasing recently. For this purpose, it is seen that the misuse of TT is increasing with the spread of the transdermal testosterone formulation, especially among bodybuilders. High-quality video produced by physicians on the use of testosterone for whatever

purpose in eugonadal people is lacking on YouTube. In particular, high-quality videos about the use of testosterone in eugonadal people should be produced, and the YouTube algorithm should support increasing the viewing of these videos in order to prevent the misuse of testosterone.

The superiority of the study is that it is the first study about the quality of YTVs related to TT. Although, this study has several limitations. First of all, only urologists (no endocrinologists) evaluated the videos. The medical knowledge level of viewers may bias the quality of the results. Second, we only analyzed the top 30 videos for each searching term. Another limitation is language. We analyzed only English videos. Finally, YouTube's algorithm personalizes all results, so the results can be different for each researcher. This can cause bias when determining the top 30 videos for our study.

CONCLUSION

YouTube is a widely used platform by patients and the others (such as physicians and students) as a source of health care data, but most viewed videos are unreliable. The importance of true information about testosterone usage requires uploading high-quality videos with an optimal duration. The impact of high-quality information for both public health and individual patients could be debated. In this study, we showed that videos created by physicians are more reliable. In order to improve the quality of health-related YTVs, it is critical that physicians produce high-quality videos, and YouTube algorithms should direct individuals to these videos.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Emin Taha Keskin;* ***Design:*** *Emin Taha Keskin;* ***Control/Supervision:*** *Harun Özdemir;* ***Data Collection and/or Processing:*** *Emin Taha Keskin, Harun Özdemir;* ***Analysis and/or Interpretation:*** *Emin Taha Keskin;* ***Literature Review:*** *Emin Taha Keskin;* ***Writing the Article:*** *Emin Taha Keskin, Harun Özdemir;* ***Critical Review:*** *Emin Taha Keskin, Harun Özdemir.*

REFERENCES

1. Wu FC, Tajar A, Beynon JM, Pye SR, Silman AJ, Finn JD, et al; EMAS Group. Identification of late-onset hypogonadism in middle-aged and elderly men. N Engl J Med. 2010;363(2):123-35. [Crossref] [PubMed]
2. Anaissie J, DeLay KJ, Wang W, Hatzichristodoulou G, Hellstrom WJ. Testosterone deficiency in adults and corresponding treatment patterns across the globe. Transl Androl Urol. 2017;6(2):183-91. [Crossref] [PubMed] [PMC]
3. Sansone A, Sansone M, Selleri R, Schiavo A, Gianfrilli D, Pozza C, et al. Monitoring testosterone replacement therapy with transdermal gel: when and how? J Endocrinol Invest. 2019;42(12):1491-6. [Crossref] [PubMed]
4. Arver S, Stief C, de la Rosette J, Jones TH, Neijber A, Carrara D. A new 2% testosterone gel formulation: a comparison with currently available topical preparations. Andrology. 2018;6(3):396-407. [Crossref] [PubMed]
5. Gul M, Diri MA. YouTube as a source of information about premature ejaculation treatment. J Sex Med. 2019;16(11):1734-40. [Crossref] [PubMed]
6. Bernard A, Langille M, Hughes S, Rose C, Leddin D, Veldhuyzen van Zanten S. A systematic review of patient inflammatory bowel disease information resources on the World Wide Web. Am J Gastroenterol. 2007;102(9):2070-7. [Crossref] [PubMed]
7. Charnock D, Shepperd S, Needham G, Gann R. DISCERN: an instrument for judging the quality of written consumer health information on treatment choices. J Epidemiol Community Health. 1999;53(2):105-11. [Crossref] [PubMed] [PMC]
8. Silberg WM, Lundberg GD, Musacchio RA. Assessing, controlling, and assuring the quality of medical information on the Internet: Caveant lector et viewor--Let the reader and viewer beware. JAMA. 1997;277(15):1244-5. [Crossref] [PubMed]
9. Salman MY, Bayar G. Evaluation of quality and reliability of YouTube videos on female urinary incontinence. J Gynecol Obstet Hum Reprod. 2021;50(10):102200. [Crossref] [PubMed]
10. Loeb S, Sengupta S, Butaney M, Macaluso JN Jr, Czarniecki SW, Robbins R, et al. Dissemination of misinformative and biased information about prostate cancer on YouTube. Eur Urol. 2019;75(4):564-7. [Crossref] [PubMed]
11. Ku S, Balasubramanian A, Yu J, Srivatsav A, Gondokusumo J, Tatem AJ, et al. A systematic evaluation of youtube as an information source for male infertility. Int J Impot Res. 2021;33(6):611-5. [Crossref] [PubMed] [PMC]

12. Fode M, Nolsøe AB, Jacobsen FM, Russo GI, Østergren PB, Jensen CFS, et al; EAU YAU Men's Health Working Group. Quality of Information in YouTube Videos on Erectile Dysfunction. Sex Med. 2020;8(3):408-13. [Crossref] [PubMed] [PMC]
13. Betschart P, Pratsinis M, Müllhaupt G, Rechner R, Herrmann TR, Gratzke C, et al. Information on surgical treatment of benign prostatic hyperplasia on YouTube is highly biased and misleading. BJU Int. 2020;125(4):595-601. [Crossref] [PubMed]
14. Warren CJ, Wisener J, Ward B, Behbahani S, Shah T, Fano A, et al. YouTube as a patient education resource for male hypogonadism and testosterone therapy. Sex Med. 2021;9(2):100324. [Crossref] [PubMed] [PMC]
15. Duran MB, Kizilkan Y. Quality analysis of testicular cancer videos on YouTube. Andrologia. 2021;53(8):e14118. [Crossref] [PubMed]
16. Ozsoy-Unubol T, Alanbay-Yagci E. YouTube as a source of information on fibromyalgia. Int J Rheum Dis. 2021;24(2):197-202. [Crossref] [PubMed]