Ann Med Res

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Annals of Medical Research

journal page: www.annalsmedres.org

Readability and quality levels of websites that contain written information about lateral epicondylitis: A survey of Turkish websites

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ARTICLE INFO

Keywords:
Ateşman formula
Internet information
Lateral epicondylitis
Online search
Readability
Tennis elbow

Received: Aug 21, 2023
Accepted: Sep 19, 2023
Available Online: 27.09.2023

DOI:
10.5455/annalsmedres.2023.08.209

Abstract

Aim: This study aimed to evaluate the contents and readability levels of informational texts about lateral epicondylitis (LE) on Turkish websites.

Materials and Methods: In this cross-sectional study, we performed online searches using the Turkish terms for 'lateral epicondylitis' and 'tennis elbow' on the Google, Yandex, and Yahoo search engines on May 8, 2022, and recorded the first ten pages of each search result. We classified the websites according to their sources. Group 1 was classified as websites prepared by private hospitals or medical centers, Group 2 as individual websites of orthopedic or physical therapists, and Group 3 as non-profit websites providing general health information that did not fall into the first two groups. Two reviewers analyzed the websites based on the website interface and the scoring for the LE content.

Results: Among the 89 analyzed websites, there was no significant difference between the groups regarding Ateşman Readability Index scores. Group 1 got the highest score in terms of website content, closely followed by Group 2. The website content score of Group 3 was significantly lower than the other two groups ($p< 0.05$).

Conclusion: The readability level of the texts on the informational Turkish websites related to LE is above the education level of our country. Further studies should be carried out on the propagation of internet accreditation systems, which aim to increase the reliability of the information on websites, also for Turkish websites. Accordingly, the development of future LE-related websites should comply with evidence-based guidelines and be written at an appropriate level to ensure the availability of reliable and understandable information for patients.

Introduction

The Internet is a rapidly developing tool for individuals to access information about their health status. According to the 2021 Turkish Statistical Institute (TSI) data, the rate of households with internet access in Turkey has increased from 90.7% to 92.0%, compared to the previous year, while the rate of individual internet use in the 16-74 age group has increased from 79% to 82.6%; suggesting a high rate for internet usage and thus obtaining information from the Internet [1]. According to a study, more than half of the individuals who researched their health status online made decisions about their health according to the information on the websites they visited [2]. While in developed countries such as the United States and Japan, the primary source of information for more than 70% of the population, especially for self-care management, is the Internet, the use of the Internet to access health information has increased similarly in a rapid fashion in other developing countries [3, 4]. Existing data show that the Internet is an essential reference source for health-related issues worldwide and in Turkey. The accuracy and comprehensibility of the content of the data obtained from this source is a matter of debate [5].

The fact that the value of the informational content given on the Internet is related to the ability of the patients to understand it renders the 'readability' and 'comprehensibility' of these data as important as the reliability and currency of the data. Readability is a concept related to the difficulty of reading any text and can be measured with specific mathematical formulas [6, 7]. According to the American National Institutes of Health data, approximately 40% of the American population is insufficient in health literacy. Therefore, it is recommended that the texts be written on par with a six-year education level or below to maximize the understanding of complex med-

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ical information [8]. In a similar study in Turkey in 2014, 64.6% of the population reported poor health literacy [9].

Lateral epicondylitis (LE), commonly known as 'tennis elbow,' is an orthopedic condition that affects 1% to 3% of the population [10, 11]. In addition, the information on the websites about this common orthopedic ailment that causes loss of workforce is crucial for patients. The fact that LE is seen especially in young people who use the Internet more commonly indicates the importance of online resources [12]. For this reason, the informational texts on the websites about LE must be read accurately and clearly. Our literature review found no previous research on the readability of Turkish websites related to LE.

In this study, we hypothesized that the readability levels of the Turkish websites containing information about LE were higher than the education level of our country. We also hypothesized that the quality and accessibility of the information received from websites are affected by the type of available websites. Therefore, we aimed to evaluate the quality, accessibility, and readability of Turkish online resources related to LE.

Materials and Methods

In this descriptive and cross-sectional study, we analyzed the results of online searches at Turgut Ozal University Malatya Training and Research Hospital using the Turkish terms for 'lateral epicondylitis' and 'tennis elbow' on the Google, Yandex, and Yahoo search engines on May 8, 2022. Google, Yandex, and Yahoo are Turkey's top three search engines, with 80.73%, 16.96%, and 0.96% usage rates, respectively [13]. For each search, we examined the data on 600 websites on the first ten pages of the search result. The search settings were set to return Turkish websites only, while all searches were carried out in the same place on the same day. The cookie caches of the websites were cleared before each hunt. In our evaluation, we excluded the forums, chat sites, commercial sales sites, and sites containing academic medical articles that included less than ten sentences, websites containing no written but visual data such as tables, pictures, and videos, and paid websites. We also omitted the copyright notices, author information, image titles, phone numbers, and website links from the text to be evaluated to avoid inaccurately affecting the readability results. We copied the informational texts on the websites that met our criteria and transferred them to the Microsoft Word 2019 software (Microsoft Corp., Redmond, WA, USA). Then, we shared the data obtained after the analysis to the Microsoft Excel 2019 software (Microsoft Corp.). We classified the websites according to their sources. Group 1 was classified as websites prepared by private hospitals or medical centres, Group 2 as individual websites of orthopaedic or physical therapists, and Group 3 as non-profit websites providing general health information that did not fall into the first two groups. The websites were evaluated by two orthopaedic and traumatology surgeons with at least four years of experience and blinded to keywords and search engines for the quality and accuracy of the material obtained. Our study was carried out according to the principles of the Declaration of Helsinki and with the approval of the Ethics Committee of Turgut Ozal University Malatya Training and Research Hospital, with decision no: 2022/143.

Readability analysis

The Ateşman formula, used to determine the readability level of Turkish texts, was used to calculate the readability level of the informational texts on the websites [14]. First, the texts edited in Microsoft Word were transferred to a computer software program and analyzed automatically. Then, to confirm the accuracy of the results obtained, the Ateşman formula average number of words, the average number of syllables, and the average number of words of four syllables and above were calculated manually using Excel.

Another tool that is used to tell us the readability of a text is the Flesch Reading Ease Formula, which is calculated based on word length and sentence length. The average sentence length in the text is inversely proportional to the readability and comprehensibility of the sentence; as the sentence length increases, its readability and intelligibility decrease. Ateşman formula is based on word and sentence length created by adapting the Flesch Reading Ease Formula into Turkish [14]. According to the Ateşman formula, as the readability level of a text approaches 100, it gets easier to understand. In contrast, it is considered more challenging to know as it comes to 0 (Table 1). The Ateşman readability formula follows the Readability score = 198,825 - 40,175 × (total syllables/total words) - 2,610 × (total words/total sentences).

Website content analysis

We calculated the quality Score of the websites using a scoring system developed by Dy et al. [15]. This scoring consists of 33 criteria, including the general characteristics of LE, treatment options, and complications. The scoring ranges from 0 to 33 points, with 33 points indicating the site with the maximum quality (Table 2).

Each website was evaluated and scored separately by two independent auditors. The content score was calculated by averaging the scores of the independent auditors, and interobserver variability was noted.

Website interface evaluation

The currency, accessibility, and validity of the information on the websites were evaluated using the criteria given in Table 3. These criteria were determined using an assessment score applied in a previous study [16].

Statistical analysis

Statistical analyses were performed using the SPSS v.25.0 software. The conformity of the variables with normal distribution was examined using histograms and the Kolmogorov-Smirnov test. The mean, standard deviation, median, and IQR values were used while presenting descriptive analyses. The categorical variables were compared with Pearson's chi-square test. The ANOVA test was used in evaluating the normally distributed (parametric) variables between the groups, and the post hoc results were analyzed using Tukey's test. Interobserver agreement

Table 1. Ateşman-Flesch scores for readability and education levels.

Readability level	Ateşman score	Level of education
Very easy	90-100	4^{th} grade and below
Easy	80-89	5^{th} or 6^{th} grade
Nearly easy	70-79	7^{th} or 8^{th} grade
Standard	60-69	9^{th} or 10^{th} grade
Nearly hard	50-59	11^{th} or 12^{th} grade
Hard	40-49	Associate degree
Very hard	39 and below	University

was presented using the intraclass correlation coefficient. Results with a p-value below 0.05 were considered statistically significant.

Results

On May 8, 2022, we accessed and examined 600 websites, 100 for each keyword, accessed from the Internet search engine and analyzed. After the application of the exclusion criteria, duplicate (n=353) websites, those within the scope of the exclusion criteria (n=154), and irrelevant websites (n=4) were excluded from the study. Of the remaining 89 websites, 28 (32%) were websites prepared by private hospitals and medical centers, 42 (47%) were individual websites of orthopedic or physical therapy doctors, and 19 (21%) were non-profit websites providing general health information (Figure 1).

Website interface evaluation

In intergroup comparisons, we observed a significant difference, especially in terms of the date of last update present, disclosure of authorship, author credentials, financial disclosure, presence of commercial ads, presence of sponsorship, privacy statement, commercial interest, and links to commercial interest (Figure 2).

Readability analysis

There was no significant difference between the groups regarding Ateşman Readability Index scores. Group 1 got the highest score in terms of website content, closely followed by Group 2. The website content score of Group 3 was significantly lower than the other two groups (Table 4).

Website content analysis

The observers had a high degree of agreement regarding website content measurements (Table 5).

Discussion

As in the world, patients in our country are rapidly turning to the Internet as a source of health services information. Our study is the first to analyze the readability and quality of Turkish websites containing informational texts on LE. The most important finding of our study was that the readability level of Turkish websites containing informational texts on LE was 'nearly difficult' as they had a score of 50-59 according to the Ateşman formula and on par with people who are educated at the 11^{th} or 12^{th}-grade level according to the Flesch formula. In addition, we determined that the quality of the information on non-profit websites that provide general health information was of

Table 2. Criteria used for quality evaluation of the websites.

1	Diagnosis and evaluation.
2	Lateral epicondylitis is also known as tennis elbow.
3	Lateral epicondylitis involves tendons on the lateral/"outside" elbow.
4	Tendons attach/anchor muscle to bone.
5	The extensor carpi radialis brevis is involved.
6	The extensor carpi radialis brevis attachment to bone is involved.
7	The lateral epicondyle is part of the humerus.
8	Lateral epicondylitis is caused by overuse.
9	Lateral epicondylitis does not only occur in athletes.
10	Lateral epicondylitis can cause pain on the lateral/"outside" elbow.
11	Pain from lateral epicondylitis can be worsened by gripping/lifting.
12	Patients can have weakened grip.
13	The symptoms of lateral epicondylitis can develop gradually.
14	The diagnosis of lateral epicondylitis includes the test of resisted wrist extension.
15	A physician may order an EMG to rule out nerve compression.
16	Treatment.
17	Treatment of lateral epicondylitis begins with rest and activity modification.
18	Treatment of lateral epicondylitis includes oral anti-inflammatories.
19	Equipment modification may be recommended for lateral epicondylitis.
20	Physical therapy and stretching may be helpful for lateral epicondylitis.
21	Bracing may be recommended for lateral epicondylitis.
22	Steroid injections may be recommended to treat lateral epicondylitis.
23	Shockwave therapy is a possible treatment for lateral epicondylitis.
24	Surgery is an option if there is no response to 6-12 months of non-operative treatment.
25	Surgery involves removing diseased tissue.
26	Surgery may be done open or arthroscopically.
27	Physical therapy is required after surgery.
28	Gradual strengthening before full activity.
29	Recovery can take months after surgery.
30	Complications and results.
31	There is a risk of neurovascular damage with surgery.
32	There is a risk of infection with surgery.
33	There is a risk of loss of strength with surgery.

Table 3. Website interface criteria.

Date of last update present	Presence of sponsorship
Copyright notice	Privacy Statement
Statement of purpose	Subscription/log in
Disclosure of authorship	Contact information
Author credentials	Commercial interest
Financial Disclosure	Links to commercial interest
Presence of ads	Third-party seal

Table 4. Intergroup comparison of the websites regarding readability and content.

		Group 1	Group 2	Group 3	Group 1-2	Group 1-3	Group 2-3	p
Ateşman readability index	Mean±SD Median (IQR)	56.58±6.51 56.9 (52.4-61.4)	57.83±7.53 59.7 (54.3-61.6)	56.9±11.80 53.7 (49.8-62.6)	0.789	0.991	0.921	0.793
Website content observer 1	Mean±SD Median (IQR)	16.87±4.01 17.5 (14.0-19.0)	16.34±5.31 17.0 (11.5-19.0)	12.67±5.92 12.0 (7.0-18.0)	0.898	**0.026**	**0.043**	**0.025**
Website content observer 2	Mean±SD Median (IQR)	16.87±3.81 17.5 (14.0-19.0)	16.36±4.97 17.0 (12.0-19.0)	12.73±5.86 12.0 (7.0-18.0)	0.897	**0.021**	**0.034**	**0.020**

(ANOVA-Tukey HSD). IQR: interquartile range, SD: standard deviation. Significant p values are written in bold.

Table 5. Interobserver reliability.

	ICC (95% CI)		ICC (95% CI)
Single Measures	0.992 (0.987-0.994)	Average Measures	0.996 (0.994-0.997)

CI: confidence interval, ICC: intraclass correlation coefficient.

lower quality than the information on other websites. We have shown that the quality of information on LE can depend on several factors, such as the website's author and whether the website is seeking commercial gain.

In their survey, Kim et al. showed that most patients used the internet before consulting a doctor [17]. The usefulness of such information accessed on the websites only depends on the patient's adequate understanding. The comprehension and interpretation of health information are related to literacy [18,19]. In our study, we determined that the readability level of Turkish websites containing informational texts about LE was on par with those educated at the 11th or 12th-grade level. According to the TUIK data, the average education period of individuals in our country in 2015 was reported to be 6.5 years [20].

For this reason, we can assume that Turkish websites about LE will not be comprehended and interpreted by

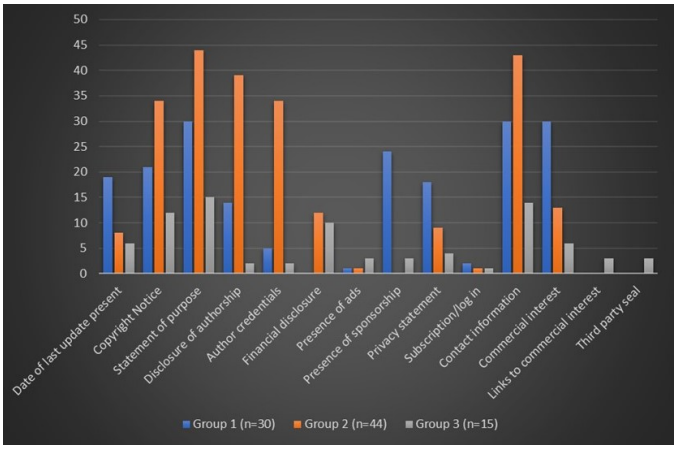

Figure 2. Evaluation of the website interface. This chart shows the number of websites offering the intergroup distribution of each search term.

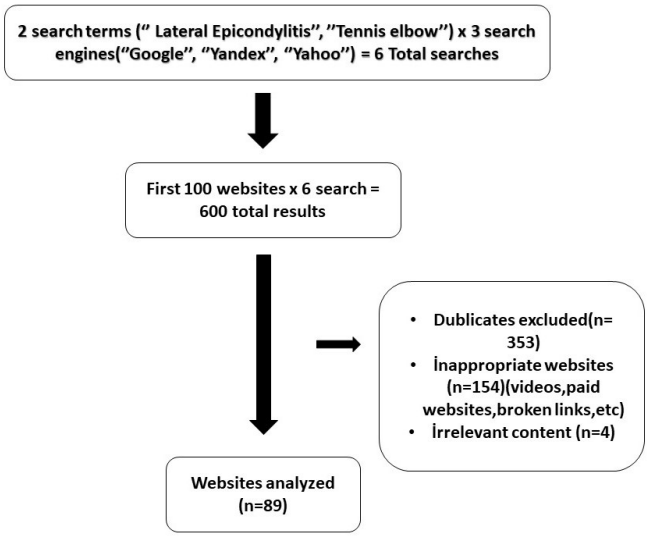

Figure 1. Flowchart of the study (lateral epicondylitis, tennis elbow).

a large part of society. Patients with high health literacy also prefer simplified language in written health materials [21]. In the USA, it is recommended that medical information be written according to the sixth-grade level or below, avoiding medical terminology to make medical information more understandable [8]. Studies on readability have shown that after the removal of medical terminology, the readability scores of informational texts change as the reader becomes more understanding [22, 23]. Since the Internet can be accessed today using smartphones, tablets, and notebooks, patients use online resources as a source of medical information. Therefore, health-related information on the Internet must be prepared correctly and readably suitable for most of society. A study conducted in our country showed that the rate of researching health-related information was 59.6% [24]. For such reasons, the accuracy, quality, and comprehensiveness of informational texts are as important as the readability of the texts in preventing adverse effects on public health [25]. Sahin et al. evaluated the readability level of the readers on the

anterior cruciate ligament. They found that 38.8% of the 85 websites they examined were at the 10-12th grade level, while one website had a readability score below the 8th-grade level [26]. In our study, 37 (41.6 %) of the 89 websites had a readability score corresponding to 11th - 12th graders and two (2.2%) had a readability score that reached below 8th grade. In a study by Barrow et al., the authors evaluated the quality of osteoarthritis-related websites (OA). They showed that, in general, the content of the websites available for patients seeking information about OA was of a high standard; that is, it had a low level of comprehensibility [27]. There was no significant difference between the groups regarding Ateşman Readability Index scores. Group 1 got the highest score in terms of website content, closely followed by Group 2. The website content score of Group 3 was significantly lower than the other two groups ($p < 0.05$). Therefore, patients who obtain information from the Internet risk accessing unverified and unreliable materials that may adversely affect their decision-making process.

The patient-physician relationship and who informs the patient how much are significant when making serious decisions, especially surgical ones. Patients may forget or misunderstand the information they receive from doctors [28, 29]. In one study, Kitching et al. showed that 50% of the patients could not remember the information they received from their physician 5 minutes after talking to the physician. The authors also stated that 90% of the patients who received written information had a positive attitude. Therefore, the researchers concluded that well-written, comprehensible written texts benefit patients and their relatives [29]. In another study, Blinder et al. [30] evaluated patients' compliance with instructions after oral surgery and reported that written information was better remembered as the patients better adhered to treatment. Therefore, written recommendations should be provided in addition to verbal explanations. Lam et al. showed that people could make practical decisions regarding their treatment choices since they trust more easily readable sources [31]. A study by Çatal et al. that evaluated the quality, accuracy, and readability of Turkish online resources for platelet-rich plasma (PRP) injections revealed that the information in online resources was of low quality and low accuracy and also challenging to read [32]. Our study determined that the readability of websites containing written information about LE was above the literacy level in our country. Considering that the period for informing patients in our country is relatively short due to the working conditions of our healthcare system may cause patients to be directed to written sources for more information, we support the idea that written sources related to LE should be prepared according to the literacy level of the country.

The first limitation of our study was using the two most common search terms in our search, while patients may use different words when searching on websites. Second, due to the dynamic and volatile environment of the Internet, we could only assess the quality and readability of these websites for a single period. Third, our content analysis noted too much topic-specific information regarding LE. We have tried to render our rating scale standard and objective. Still, the possibility of observer bias in the website ratings of the physicians participating in the evaluation cannot be excluded. We used the scoring average of two independent and double-blind reviewers to eliminate this disadvantage.

Conclusion

In conclusion, our study is the first to evaluate the readability of information on Turkish websites about LE. In assessing the literacy level in our country, we observed that the contents on Turkish websites related to LE were complicated for an average reader to understand and had relatively low scores in terms of quality. We believe that, with some arrangements, the readability level of the informational texts on the websites can be brought to a literacy level on par with an 8th grader or below, and the quality can be increased, consequently improving communication between the patient and the physician.

We would also like to underline the importance of classifying Turkish medical websites regarding quality and readability. Studies should be carried out on the propagation of internet accreditation systems, which aim to increase the reliability of the information on websites that are easily accessible by everyone, also for Turkish websites. Accordingly, the development of future LE-related websites should comply with evidence-based guidelines and be written at an appropriate level to ensure the availability of reliable and understandable information for patients.

Highlights

It has been observed that the readability level of the information texts on the Turkish websites related to LE is above the education level of our country. The content of the websites that patients refer to for their health status should be arranged according to the literacy level of the people. We think the favorable regulations to be made on the websites will positively affect the patient-physician relationship as people can understand the medical texts better.

Declaration of conflicting interests

The authors declare no conflicts of interest with this article.

Funding

The authors have received no financial support for the authorship of this article.

Availability of data

Datasets created and/or analyzed during the current study are not available to the public due to local data protection laws, but are available from the corresponding author upon reasonable request.

Ethical approval

Ethical approval for this study was obtained from Turgut Ozal University of Ethics Committee Review Board (Approval Number /ID: 2022/143). The study was conducted following the principles of the Declaration of Helsinki.

Author contributions

Conception; MBoz,AASahin . Design ; MBoz . Supervision; MBoz. Fundings; MBoz . Materials; MBoz. Data Collection and/or Processing; MBoz,AASahin. Analysis and/or Interpretation; MBoz,AASahin. Literature Review; MBoz,AASahin. Writing; MBoz. Critical Review; MBoz,AASahin.

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