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

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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-
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
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 11th or 12th-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 4. Intergroup comparison of the websites regarding readability and content.

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

Table 5. Interobserver reliability.

<table>
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<tr>
<th></th>
<th>ICC (95% CI)</th>
<th>ICC (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Measures</td>
<td>0.992 (0.987-0.994)</td>
<td>Average Measures 0.996 (0.994-0.997)</td>
</tr>
</tbody>
</table>

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 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

![Figure 1](image1.png)

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

![Figure 2](image2.png)

Figure 2. Evaluation of the website interface. This chart shows the number of websites offering the intergroup distribution of each search term.
We have tried to render our rating scale standard and noted too much topic-specific information regarding LE. Websites for a single period. Third, our content analysis could only assess the quality and readability of these to the dynamic and volatile environment of the Internet, common search terms in our search, while patients may use The first limitation of our study was using the two most the country. Considering that the period for in- forming written information about LE was above the literacy level in our country. The content of the websites that patients refer to for their health status 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

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1. 14. Ateşman E. Measuring readability in Turkish. ATömer Lan-


