

Readability and Understandability of Turkish Migraine Websites: An Evaluation of Fifty Online Resources

Ahmet Hilmi Günüç¹

¹ Department of Algology, Isparta City Hospital, Isparta, Türkiye

Abstract

Aim: Online health information can only benefit patients if it is presented in language they can easily read and understand.¹ Migraine is a common neurological disorder in Türkiye, but the readability of Turkish-language migraine websites has been uncertain. This study evaluated 50 Turkish migraine websites spanning hospitals, professional associations, media, physician blogs, health portals, and encyclopedic sources. Textual readability was measured using three established Turkish formulas, and each site's language and layout were qualitatively reviewed.

Methods: For each site, readability scores were calculated with the Ateşman Reading Ease (Turkish Flesch adaptation), the Çetinkaya-Uzun formula, and the Bezirci-Yılmaz grade-level index. Scores were interpreted by standard difficulty bands (e.g., "easy" vs "difficult"), and structural features (sentence length, medical jargon, use of headings, lists, Q&A format) that could affect understandability were noted.

Results: Overall readability was poor. None of the 50 sites were classified as "easy" to read; approximately 75% fell into "difficult" or "very difficult" ranges, indicating they demand advanced reading skills. Hospital and professional association pages had especially low readability, often equivalent to a high-school or college reading level. Even the relatively simpler media articles and health portal pages were only "moderately difficult," above the recommended middle-school level.

Conclusions: The current readability of Turkish migraine websites is unacceptably low, with most content requiring at least a high-school education to comprehend. To better serve patients, Turkish health websites should be rewritten and redesigned with clarity in mind.

Keywords: Migraine disorders; health literacy; readability; internet; comprehension

1. Introduction

Migraine is a leading cause of disability worldwide and affects a significant portion of the population.² In Türkiye, it is a prevalent neurological condition that especially impacts women.³ Given its chronic, recurrent nature and effect on quality of life, effective patient education about migraine triggers, treatments, and prevention is vital.⁴ Today, a large share of health education occurs informally via the internet. Over 70% of Turkish adults report using the internet to seek health information.⁵ Unfortunately, prior research across different health topics shows that much online material is written at reading levels too advanced for the general public.⁶

Even in highly developed countries, many adults have only basic reading proficiency, yet patient education materials often exceed recommended readability levels.⁷ In Türkiye, the average adult has about 8 years of formal education. Nonetheless, many Turkish health websites are written as if for experts, requiring high-school or even university-level reading skills.⁸ Previous analyses of Turkish health websites on other conditions have consistently found poor readability. In a 2020 evaluation of Turkish COVID-19 information

sites, the majority of pages were rated "moderately difficult" by Ateşman criteria, with none in the "easy" range for patients.⁹ Similarly, an assessment of Turkish fibromyalgia websites found over two-thirds of sites to be "difficult" or "very difficult" to read, with the average required education level about five years higher than the national average.⁵ Migraine patients frequently turn to online sources for guidance on symptoms and treatment, so it is important to determine whether these migraine-related websites communicate information in an accessible way.¹⁰

The present study addresses this gap by evaluating the readability and understandability of 50 Turkish-language websites about migraine. Text from a variety of sources (hospital sites, professional organizations, news media, etc.) was analyzed using validated Turkish readability formulas. In addition, each site's writing style and layout features that might affect user comprehension (such as the use of headings, technical jargon, or interactive elements) were qualitatively reviewed. By combining the quantitative readability scores with these qualitative observations, our goal was to get a

well-rounded picture of how comprehensible the current online migraine information is and to identify practical ways it could be improved. Ultimately, ensuring that health information is easy to read is a key step toward better educating and empowering patients.¹¹

2. Materials and Methods

2.1. Website Selection

In September 2025, the search queries “migren,” “migren nedir,” “migren belirtileri,” and “migrene ne iyi gelir” were entered into Google Search, and the first 104 websites returned were catalogued. From this pool, 50 websites were selected for inclusion in the study. The selection was limited to general informational content intended for patients or the public. Sites that primarily featured videos or user forum discussions, or had very little textual content, were excluded. Each included site was categorized by its source type: (1) Hospital websites (n = 28), (2) Professional association websites (n = 3), (3) News media health articles (n = 3), (4) Physician blogs (n = 5), (5) Health information portals (n = 8), and (6) Encyclopedic sources (e.g., Turkish Wikipedia, n = 3).

2.2. Readability Measures

For each website, the main body text was extracted and three Turkish readability metrics were calculated. The Ateşman Readability Score produces a score from 0 (very difficult) to 100 (very easy) based on average sentence length and average word length in syllables.¹² Higher scores indicate easier reading. Each text was classified into the standard Ateşman difficulty categories (e.g., scores below 50 are considered “difficult” texts, whereas 70+ would be “easy”).¹² The Çetinkaya-Uzun Readability Formula also uses sentence and syllable counts, but its output is interpreted in three broad levels analogous to educational reading ability.¹² A score ≥ 51 indicates an “independent” reading level (easily understood by lay readers, roughly 5th–7th grade), 35–50 indicates an “instructional” level (moderately difficult, about 8th–9th grade level, can be understood with some help), and < 35 falls in the “frustration” level (very hard to understand without expert assistance, roughly 10th grade and above).¹² The Bezirci-Yılmaz Readability Index estimates the years of education needed to comfortably read a text. It incorporates sentence length and the proportion of long words (usually defined as words with ≥ 3 syllables). The resulting number corresponds to a grade level; for example, a score of 8 implies the text is suitable for an 8th-grade reader, 12 indicates high school level, and scores above 16 suggest postgraduate-level complexity.¹³ For each site, the Bezirci-Yılmaz score was recorded and the implied education category (primary school, high school, university, or postgraduate) was noted. All calculations were performed using a custom script to count sentences, words, and syllables in the Turkish text, then apply the published formula equations.

2.3. Qualitative Evaluation

Beyond the numerical scores, each website’s content presentation and writing style were qualitatively examined, since factors like formatting and tone can influence understandability. Each migraine page was reviewed and key features were noted, including: overall sentence structure (short and simple vs. long, complex sentences), the use of medical vocabulary or jargon (and whether any lay explanations were provided for technical terms), the organization of content with headings or subheadings, the use of lists or bullet points to break up information, the presence of any question-and-answer (FAQ) sections, the tone of writing (formal/academic vs. conversational, and whether it addresses the reader directly), and the inclusion of any visuals or tables that aid comprehension. This qualitative review helped contextualize the readability scores and identify why certain texts might be difficult. No formal scoring was assigned in this part; instead, the observations were synthesized to report gen-

eral trends.

Since all data were publicly available website content and no human subjects were involved, ethics approval was not required for this study.

3. Results

3.1. Readability Scores Overview

Overall, the readability of Turkish migraine websites was poor. The vast majority of sites would require more than a basic education to fully understand. According to the Ateşman formula, none of the 50 websites achieved a “very easy” or even “easy” readability rating. In fact, most sites fell into the “difficult” or “very difficult” categories. Approximately 92% of the sites (46 out of 50) exceeded an eighth-grade reading level, and about two-thirds would demand at least a high school education. This confirms that typical Turkish migraine content is written well above the recommended level for general audiences.

Looking at differences by source type, it was found that all categories of websites were affected by readability issues, though to varying extents.

In summary, 46 out of 50 sites (92%) exceeded an eighth-grade reading level based on the applied metrics, and more than two-thirds would require a reader with at least a high school education. No site in the sample truly met the “plain language” standard of being easily readable by the general public. No strong differences between the source categories were found in a statistical sense – readability was a near-universal problem across all types of sites. An analysis of variance did not show a significant variation in Ateşman or Bezirci-Yılmaz scores by category ($p > 0.05$). This is consistent with observations from other studies on health information: regardless of who produces the content, patient-facing materials often end up written in overly complex language.¹⁴ Table 1A presents the readability assessment for each of the 50 Turkish migraine websites, categorized by three different formulas.

3.2. Qualitative Factors Affecting Understandability

The qualitative review helped explain why these websites scored poorly on readability and highlighted some opportunities for improvement. Several common themes emerged:

- **Excessive sentence length:** Many sites presented information in very long sentences. Indeed, it has been noted that Turkish health documents with short average sentences achieve better readability scores.¹⁵
- **Medical jargon and lack of explanations:** Nearly all sites were heavy with medical terminology.
- **Structure and formatting:** Most sites did use headings or section titles. However, the content under each heading was often presented as a single long block of text.
- **Use of Q&A or conversational tone:** Only 2 out of 50 sites (4%) employed an explicit question-and-answer format to present information.
- **Tone and perspective:** Many texts were written about patients rather than to patients.
- **Visual aids:** This represents another area where content creators should improve understandability by including well-thought-out visuals or summary elements to enrich the text.¹⁶

In summary, the qualitative findings corroborate the quantitative readability scores by revealing the specific writing and design issues that make these migraine websites difficult to understand.

Table 1B documents key structural and stylistic features of the same 50 migraine information sites, which can substantially impact their understandability.

Table 1A**Readability Classifications of Migraine Websites**

Code	Category	Ateşman Level	Çetinkaya-Uzun Level	Bezirci-Yılmaz Level
H01	Hospital	Difficult	Frustration	High school
H02	Hospital	Difficult	Frustration	High school
H03	Hospital	Difficult	Frustration	High school
H04	Hospital	Difficult	Frustration	High school
H05	Hospital	Medium	Instructional	High school
H06	Hospital	Very Difficult	Frustration	Undergraduate
H07	Hospital	Difficult	Frustration	High school
H08	Hospital	Difficult	Frustration	High school
H09	Hospital	Difficult	Frustration	High school
H10	Hospital	Difficult	Frustration	High school
H11	Hospital	Difficult	Frustration	High school
H12	Hospital	Difficult	Frustration	Undergraduate
H13	Hospital	Difficult	Frustration	High school
H14	Hospital	Difficult	Frustration	High school
H15	Hospital	Medium	Instructional	High school
H16	Hospital	Difficult	Frustration	High school
H17	Hospital	Difficult	Frustration	High school
H18	Hospital	Very Difficult	Frustration	Undergraduate
H19	Hospital	Very Difficult	Frustration	Undergraduate
H20	Hospital	Difficult	Frustration	High school
H21	Hospital	Difficult	Frustration	High school
H22	Hospital	Difficult	Frustration	High school
H23	Hospital	Difficult	Frustration	High school
H24	Hospital	Difficult	Frustration	High school
H25	Hospital	Medium	Instructional	High school
H26	Hospital	Very Difficult	Frustration	Undergraduate
H27	Hospital	Difficult	Frustration	High school
H28	Hospital	Very Difficult	Frustration	Undergraduate
A01	Association	Difficult	Frustration	Undergraduate
A02	Association	Very Difficult	Frustration	Undergraduate
A03	Association	Difficult	Frustration	Undergraduate
M01	Media	Medium	Frustration	High school
M02	Media	Medium	Instructional	High school
M03	Media	Difficult	Frustration	High school
B01	Physician	Difficult	Frustration	High school
B02	Physician	Difficult	Frustration	High school
B03	Physician	Difficult	Instructional	High school
B04	Physician	Difficult	Frustration	High school
B05	Physician	Very Difficult	Frustration	Undergraduate
P01	Portal	Easy	Instructional	Middle school
P02	Portal	Difficult	Frustration	High school
P03	Portal	Medium	Instructional	High school
P04	Portal	Difficult	Frustration	Undergraduate
P05	Portal	Medium	Frustration	High school
P06	Portal	Difficult	Frustration	Undergraduate
P07	Portal	Easy	Instructional	Middle school
P08	Portal	Medium	Instructional	High school
E01	Encyclopedia	Very Difficult	Frustration	Undergraduate
E02	Encyclopedia	Very Difficult	Frustration	Undergraduate
E03	Encyclopedia	Very Difficult	Frustration	Undergraduate

Each website is labeled with a code where the prefix letter denotes its source type (H = Hospital, A = Association, M = Media, B = Physician blog, P = Portal, E = Encyclopedia).

Table 1B**Structural Features and Content Layout**

Code	Sentence Length	Headings	Bullet Points	Q&A Format	Tone
H01	Long	Yes	No	No	Academic
H02	Long	Yes	No	No	Academic
H03	Long	Yes	No	No	Academic
H04	Long	Yes	No	No	Academic
H05	Long	Yes	Yes	No	Academic
H06	Long	Yes	No	No	Academic
H07	Long	Yes	No	No	Academic
H08	Long	Yes	No	No	Academic
H09	Long	Yes	No	No	Academic
H10	Long	Yes	No	No	Academic
H11	Long	Yes	No	No	Academic
H12	Long	Yes	No	No	Academic
H13	Long	Yes	No	No	Academic
H14	Long	Yes	No	No	Academic
H15	Long	Yes	Yes	No	Academic
H16	Long	Yes	No	No	Academic
H17	Long	Yes	No	No	Academic
H18	Long	Yes	No	No	Academic
H19	Long	Yes	No	No	Academic
H20	Long	Yes	Yes	No	Academic
H21	Long	Yes	No	No	Academic
H22	Long	Yes	No	No	Academic
H23	Long	Yes	No	No	Academic
H24	Long	Yes	No	No	Academic
H25	Long	Yes	Yes	No	Academic
H26	Long	Yes	No	No	Academic
H27	Long	Yes	No	No	Academic
H28	Long	Yes	No	No	Academic
A01	Long	Yes	No	No	Academic
A02	Long	Yes	No	No	Academic
A03	Long	Yes	No	Yes	Academic
M01	Short	Yes	No	No	Conversational
M02	Short	Yes	Yes	No	Conversational
M03	Long	No	No	No	Conversational
B01	Long	No	No	No	Academic
B02	Short	No	Yes	No	Conversational
B03	Short	Yes	No	Yes	Conversational
B04	Long	No	No	No	Academic
B05	Long	No	No	No	Academic
P01	Short	Yes	No	No	Academic
P02	Long	Yes	Yes	No	Academic
P03	Long	Yes	Yes	No	Academic
P04	Long	Yes	No	No	Academic
P05	Long	Yes	Yes	No	Academic
P06	Long	Yes	No	No	Academic
P07	Short	Yes	No	No	Academic
P08	Long	Yes	Yes	No	Academic
E01	Long	Yes	No	No	Academic
E02	Long	Yes	No	No	Academic
E03	Long	Yes	No	No	Academic

4. Discussion

The evaluation of 50 Turkish migraine websites clearly demonstrates that the readability of online migraine information in Turkish is far below optimal. Despite being intended for a general audience of patients and their families, most of this content is written at a level that would challenge even well-educated readers. These results mirror the outcomes of similar studies in other medical domains and languages, reinforcing that readability is a widespread problem in health communication.^{5,14} The findings align with prior Turkish studies that reported “difficult” readability levels for various patient-focused websites.¹⁷ A meta-narrative review of online health information quality has highlighted significant issues with the trustworthiness and usability of what patients find on the internet.¹⁸ Making sure that health information is presented clearly is a fundamental part of addressing those issues.

Many sites, especially those of hospitals and professional bodies, seem to have copied or only slightly modified text from existing medical literature or even from each other. They often present textbook-like descriptions without much simplification.

4.1. Limitations

First, readability formulas, while useful indicators, do not capture all aspects of comprehension. Some of these aspects were addressed through the qualitative analysis; however, that assessment was subjective and cannot fully substitute for actual comprehension testing. Second, the site selection, although broad, may not cover every type of platform where migraine information is shared. Third, while 50 websites is a sizable sample, it is not exhaustive of all Turkish migraine-related content on the internet. Lastly, no outcomes or impacts on actual users were measured.

5. Conclusion

In conclusion, this study found that the vast majority of Turkish-language migraine websites are written at reading levels too high for the average population. This severely limits their effectiveness as patient education resources. Improving readability is not merely a linguistic preference; it has tangible benefits for public health.¹⁹ For a condition like migraine providing understandable information can reduce disability and improve quality of life. A person with migraine seeking information online in Turkish should be able to learn about their condition without frustration. Ultimately, improving the readability of health information is a low-cost, high-impact intervention that can empower patients and foster better health outcomes in the long run.

genAI

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Conflict of interest statement

The authors declare that they have no conflict of interest.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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