

ORIGINAL ARTICLE

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Readability levels of patient information texts regarding cataract surgery on websites **Asena Keles Sahin¹**,  **Enes Uyar²**¹Ordu University, Training and Research Hospital, Department of Ophthalmology, Ordu, Turkey²Aksaray University, Training and Research Hospital, Department of Ophthalmology, Aksaray, Turkey

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**Abstract**

This study aimed to evaluate the contents and readability levels of the texts on cataract surgery on Turkish websites. A total of 300 websites were searched by the Google (www.google.com.tr) search engine using the keywords 'cataract surgery', 'phaco' and 'phacoemulsification'. Readability values of the informative texts on the websites were analysed were calculated using the Atesman and Bezirci-Yilmaz formulas. Sites prepared by private hospitals or medical centres constituted group 1, individual sites of ophthalmologists constituted group 2, and sites providing general health information that did not belong to group 1 or group 2 constituted group 3. In total, health information presented in 85 websites was analysed. According to Atesman and Bezirci-Yilmaz, the mean readability values were 49.6 ± 7.5 and 12.9 ± 2.8 , respectively. There was no statistically significant inter-group difference in terms of the average number of sentences, of words, of words with four or more syllables and of syllables ($p = 0.579$, $p = 0.434$, $p = 0.236$ and $p = 0.336$, respectively). The readability values of groups 1 and 3 were significantly different according to the Atesman and Bezirci-Yilmaz formulas ($p = 0.025$ and $p = 0.023$, respectively). In terms of content, groups 1 and 2 had relatively more comprehensive information. The readability level of information texts related to cataract surgery on Turkish websites is above the academic level recommended according to the education level of Turkey. In order to help patients make medical decisions using these websites, it is imperative to revise the contents of health information related to cataract according to the literacy level of Turkish people.

Keywords: Cataract, phacoemulsification, internet, readability**Introduction**

The internet has become a popular source of information owing to its accessibility and speed. However, the large volume of information it contains makes it difficult to judge the accuracy and quality of the available information [1].

There has been an increase in the number of websites that provide information on healthcare, and the accuracy and recency of their content along with their referrals to products have been criticised. Increased reliance on the internet as a health-related information source and the lack of a standard for the accuracy of the given information have a negative impact on public health [2]. Accessing information on the internet through the widespread use of computers and mobile phones makes it easy for patients and their

relatives to gather necessary health-related information. However, it may be difficult to access accurate and up-to-date information from the large number of websites currently available [2,3]. It was reported that 65.9% of the individuals in Turkey made a health-related internet search according to data from 2016 (Turkish Statistical Institute).

The readability of a written text is a term used to indicate whether the written text is difficult or easy to understand by the reader considering the characteristics of syllables, words and sentences [4]. Formulas for assessing readability have been developed by using criteria, including average word length, number of syllables in words, average sentence length and number of synonyms [5]. This information is an objective indicator of the reading skills an individual must possess in order to understand any written material.

Cataracts are the most common cause of blindness, worldwide. Cataract surgery is a relatively safe surgery associated with limited complications [6,7]. The information texts on websites can provide benefits such as behavior changes and compliance with treatment in patients [8]. At this stage, the information that physicians share

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on websites about cataract surgery is very important in decision-making for patients. We do not have any data on the accuracy, competence, and readability of the informative texts about cataract surgery shared on websites in Turkish. Hence, this study aimed to evaluate the content and readability levels of Turkish information texts on cataract surgery provided on websites. The readability formulas designed by Atesman and Bezirci–Yılmaz for the Turkish language were used in our study [9,10].

Materials and Methods

The data of this descriptive study was accessed through the google search engine (www.google.com.tr). In October 2020, we carried out a search using the keywords ‘cataract surgery’, ‘phaco’ and ‘phacoemulsification’, which are likely to be used by patients during an internet search. In the search results, 300 websites that appeared on the first 10 pages for each keyword search were examined. The study was conducted after obtaining approval of the Ordu University Training and Research Hospital Ethics Committee (2020/208).

Websites that contained less than 10 sentences of information, forums and chats; commercial sales websites and websites that clearly indicated healthcare professionals as their target audience were not included in the evaluation. In addition, websites containing only tables, images and videos were excluded from the study. The texts on the selected websites were copied and transferred to Microsoft Word (Microsoft Corporation, New Mexico, USA, 2019). The copyright notices, author information, image titles, training titles, website URLs, addresses and links in the information texts were removed to avoid misinterpretation of the readability evaluation results. The websites were divided into 3 groups according to their source: group 1, websites prepared by private hospitals or medical centres constituted; group 2, individual websites belonging to ophthalmologists; and group 3, non-profit websites providing general health information that were not included in these two groups.

Contents of the websites included in the study were investigated in terms of whether they included information on the definition and causes of cataract, symptoms of cataract, details on cataract surgery, intraocular lens options, possible risks and complications of cataract surgery and what patients should pay attention to after surgery (Table 1). Evaluation of the textual content was carried out by two experienced ophthalmologists. The websites evaluated were compared in terms of readability levels and textual content based on their sources.

Table 1. Assessment of the comprehensiveness of information texts

*Comprehensiveness
Topic 1. Definition and causes of cataract
Topic 2. Symptoms of cataract
Topic 3. Details of cataract surgery
Topic 4. Intraocular lens options
Topic 5. Possible risks and complications of cataract surgery
Topic 6. What patients should pay attention to after surgery
* 1 point for each topic included in the content

Readability measurement

The information texts on the websites included in the study were formatted as plain text in the Microsoft Word program and transferred to the computer software program. Atesman and Bezirci–Yılmaz readability values were calculated by analysing the average number of sentences, words, words with ≥ 4 syllables and syllables using the software program.

Atesman readability formula

This formula was developed by Atesman [9] by adapting the Flesch–Kincaid reading ease formula to Turkish considering the characteristics of the Turkish language structure [11]. It is a formula based on the length of words and sentences in a text. According to this formula, a text is evaluated as easy as its readability level approaches 100 and difficult as this value approaches 0 (Table 2).

Atesman readability formula= $198.825 - [40.175 \times (\text{syllable number/word number})] - [2.610 \times (\text{word number/sentence number})]$.

Table 2. Atesman Turkish readability ranges

Atesman value	Readability range
90-100	Very easy
70-89	Easy
50-69	Moderate difficulty
30-49	Difficult
1-29	Very difficult

Bezirci–Yılmaz readability formula

It is a formula developed based on the statistical properties of the Turkish language by using the lengths of sentences in the texts and syllable numbers of the words [10]. the readability level was calculated by multiplying the syllable numbers of the words with unique numbers as follows:

$$\sqrt{\text{AWC} \times [(S3 \times 0.84) (S4 \times 1.5) (S5 \times 3.5) + (S6 \times 26.25)]}$$

AWC: Average word count

S3: Average number of words with 3 syllables

S4: Average number of words with 4 syllables

S5: Average number of words with 5 syllables

S6: Average number of words with ≥ 6 syllables

The results obtained with this formula describe the education level in Turkey for which a particular text would be suitable. Texts with Bezirci–Yılmaz readability level results of between 1 and 8 are suitable for primary education level, between 9 and 12 for secondary (high school) level, between 12 and 16 for undergraduate level and texts with results of 16 and above are suitable for academic education level.

Statistical analysis

Statistical analysis of the results was performed using the software SPSS 22.0 (SPSS Inc., Chicago, IL, USA) for Windows.

Kolmogorov–Smirnov test was used to check the normality of data distribution. Parametric data were compared using one-way analysis of variance followed by post-hoc least significant difference (LSD) test, and nonparametric data were compared with chi-square test. A p value of < 0.05 was considered statistically significant.

Results

Among the 300 websites examined, repeated websites were eliminated, and 85 websites meeting the inclusion criteria were evaluated and analysed. On an average, the number of sentences, words, words with ≥ 4 syllables and syllables was 28.8 ± 12.9 , 339.7 ± 144.1 , 105.9 ± 47.1 and 990.4 ± 419.4 for the websites, respectively. Of the websites included in the study, 48 (56.5%) were in the first group, 20 (23.5%) were in the second group and 14 (16.5%) were in the third group. Three (3.5%) websites prepared by universities or public hospitals were not included in

the grouping and statistical analysis for comparison because of their small number.

The mean readability values according to Atesman and Bezirci–Yılmaz were 49.6 ± 7.5 and 12.9 ± 2.8 , respectively. Based on the average values of all texts, Atesman readability value was found at the limit of difficult-moderate difficulty, and Bezirci–Yılmaz readability value was found at the level of undergraduate.

When we evaluated the texts according to the source websites, no statistically significant difference was found between the groups in terms of the average number of sentences, words, words with ≥ 4 syllables and syllables ($p = 0.579$, $p = 0.434$, $p = 0.236$ and $p = 0.336$, respectively) (Table 3). In post-hoc analyses, a significant difference was found only between groups 1 and 3 in terms of Atesman and Bezirci–Yılmaz readability values ($p = 0.025$ and $p = 0.023$, respectively) (Table 4).

Table 3. Comparison of information texts according to the source of the websites

Parameters Mean $\pm$ SD		Group 1 n=48	Group 2 n=20	Group 3 n=14	P value
Number of sentence		27.8 $\pm$ 10.5	31.3 $\pm$ 12.0	29.6 $\pm$ 19.6	0.579*
Number of word		320.7 $\pm$ 113.2	359.2 $\pm$ 106.1	358.5 $\pm$ 204.6	0.434*
Number of word with ≥ 4 -syllable		97.9 $\pm$ 34.3	113.1 $\pm$ 36.4	115.7 $\pm$ 69.5	0.236*
Number of syllable		928.0 $\pm$ 321.4	1055.4 $\pm$ 308.4	1053.9 $\pm$ 605.5	0.336*
Atesman readability score		51.3 $\pm$ 6.7	49.0 $\pm$ 7.6	46.3 $\pm$ 8.2	0.066*
Bezirci–Yılmaz readability score		12.3 $\pm$ 2.3	13.2 $\pm$ 3.2	14.2 $\pm$ 3.5	0.059*
Total comprehensiveness score		3.4 $\pm$ 0.8	3.4 $\pm$ 0.9	2.3 $\pm$ 1.0	0.037*
Topic 1	Yes	42 (%87.5)	15 (%75.0)	8 (%57.1)	0.041**
	No	6 (%12.5)	5 (%25.0)	6 (%42.9)	
Topic 2	Yes	41 (%85.4)	14 (%70.0)	6 (%42.9)	0.005**
	No	7 (%14.6)	6 (%30.0)	8 (%57.1)	
Topic 3	Yes	44 (%91.7)	19 (%95.0)	12 (%85.7)	0.633**
	No	4 (%8.3)	1 (%5.0)	2 (%14.3)	
Topic 4	Yes	23 (%47.9)	7 (%35.0)	2 (%14.3)	0.070**
	No	25 (%52.1)	13 (%65.0)	12 (% 85.7)	
Topic 5	Yes	8 (%16.7)	7 (%35.0)	3 (%21.4)	0.250**
	No	40 (%83.3)	13 (%65.0)	11 (%78.6)	
Topic 6	Yes	22 (%45.8)	11(%55.0)	6 (%42.9)	0.731**
	No	26 (%54.2)	9 (%45.0)	8 (%57.1)	

SD: standard deviation, * One-way analysis of variance (ANOVA), ** Chi-square test

Table 4. Post-hoc comparisons and total comprehensiveness scores of the study groups

	P values		
	Atesman readability score	Bezirci–Yılmaz readability score	Total comprehensiveness score
Groups 1 and 2	0.236	0.207	0.790
Groups 1 and 3	0.025	0.023	0.012
Groups 2 and 3	0.282	0.295	0.044

When the contents of the texts on the websites included in the study were examined; 66 (77.6%) texts contained information on the definition and causes of cataract, 62 (72.9%) on the symptoms of cataract, 78 (91.7%) on the details of cataract surgery, 33 (38.8%) on intra-ocular lens options, 18 (21.1%) on the possible risks and complications of cataract surgery and 39 (45.8%) on what patients should pay attention to after surgery. The rate of mentioning the definition and causes of cataract and the rate of mentioning the symptoms of cataract were significantly higher in group 1 and 2 compared with those in group 3 ($p = 0.041$ and $p = 0.005$, respectively). No statistically significant difference was found between the groups in terms of other content (p values: 0.070–0.731) (Table 3). It was found that the contents of the texts were more comprehensive in groups 1 and 2 ($p = 0.012$ and $p = 0.044$, respectively) (Table 4).

Discussion

In recent years, the internet has become an information source that patients frequently refer to as a guide for medical decision-making. The health information available on internet should be accurate and have a readability level suitable for the general public. In our study, it was determined that the readability level was at the limit of 'difficult to moderate difficulty' according to the Atesman formula, and that the texts were suitable for those who received education at the 'undergraduate' level according to the Bezirci–Yılmaz formula.

Complexity and poor readability can make written material difficult to understand for patients and their relatives with low literacy levels. According to the data of the Turkish Statistical Institute, individuals' average duration of education in Turkey was 6.5 years in 2015 [12]. Studies on readability in various medical subjects in literature show that the readability levels of information texts for patients on the internet were considerably higher than the recommended level, generally [13–16]. A study by Edmunds et al. [17] covering 160 websites for 16 different ophthalmic diagnoses reported that information texts for patients were written at a readability level well above the recommended level. In our study, formulas that were suitable for Turkish word and sentence structure were used, and the readability level of the texts was determined to be above the recommended level, consistent with that in literature. In addition, we noted that the texts on the websites prepared by private hospitals or medical centres had better readability levels compared with those of the texts of non-profit websites that provide general health information.

Patients with high health literacy also prefer simplified language in written health materials and understand it more easily [18,19]. A study in the United States suggested that medical information should be written at the level of sixth grade or below, avoiding medical terminology and complicated words [20]. Studies have also shown that the readability levels of the texts changed after removing medical terminology [21,22]. In this study, the average ratio of medical terminology was found to be 5.9% for all texts.

The accuracy, comprehensibility and comprehensiveness as well as readability of the information contained in the informative texts for patients are important for preventing negative consequences on public health [1]. Unreliable health information found online by patients may lead to a lack of trust in the patient–doctor relationship

and may negatively affect clinical outcomes [23,24]. Currently, detailed information about the surgery may not be provided to patients who are recommended surgery due to the high number of patients in many institutions. Therefore, patients' access websites that they believe provide accurate information may alleviate their anxiety. Alshehri and Joury [25] evaluated the contents of articles on cataract prepared for patients on 24 websites in the English language. They reported that 95% of the websites mentioned the definition, risk factors and treatment options of cataract, and that few sites provided information on postoperative follow-up (37%) and surgical complications (45%). We observed that most of the informative texts for patients examined in our study included information about the definition of cataract, its causes and symptoms and cataract surgery. However, it was found that the texts did not provide sufficient information about the possible risks and complications of cataract surgery. In addition, only 8.2% of the websites provided information about all topics that we evaluated in terms of content in our study. It was determined that the websites prepared by private hospitals or medical centres and by ophthalmologists individually were more comprehensive in terms of content than the websites that provide general health information. The information on these sites may have been prepared to be more patient-oriented by ophthalmologists.

In the present study, formulas that only measure whether or not the words can be read effectively, and not whether or not the words can be understood, were used. The scores do not assess word choice or medical terminology. Texts made of sentences with fewer words may be more difficult to understand using medical terminology. Another limitation of the study is that the information contained in the reviewed websites had not been checked for compliance with certain standards in terms of the accuracy of the information contained and qualification of the sources. The websites prepared by the universities or public hospitals that were reviewed in the study were not included in the statistical comparison of the sources, as they were small in number. Due to the inability to categorize these institutions, the evaluations made may not provide inclusive information. Such institutions can be encouraged to provide more information on their websites about this surgery, which is commonly performed in the adults.

In conclusion, our study found that the readability level of the texts on cataract surgery on the websites in Turkish is above the level recommended based on the education level in Turkey. Examination of the textual contents demonstrated that the majority of the websites contained information about cataract surgery, but the information about the postoperative process and complications, which are important for decision-making by patients regarding surgery, was insufficient. It is necessary to revise the contents of medical information on cataract considering the literacy level of the people in Turkey.

Conflict of interests

The authors declare that they have no competing interests.

Financial Disclosure

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Ethical approval

The study was approved by Ordu University Training and Research Hospital Ethics Review Committee (Number:2020/208).

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