

## Original Article

# The Quality and Readability of English and Turkish Web-Based Dental Implant

**Zeynep Gungormus, PhD**

Professor, Department of Public Health Nursing, Faculty of Health Sciences, Gaziantep Islamic Science and Technology University, Gaziantep, Turkey

**Metin Gungormus, PhD**

Professor, Department of Surgery, Faculty of Dentistry, Gaziantep University, Gaziantep, Turkey.

**Sirin Celikkanat, PhD**

Department of Public Health Nursing, Faculty of Health Sciences, Gaziantep Islamic Science and Technology University, Gaziantep, Turkey

**Correspondence:** Professor, Department of Public Health Nursing, Faculty of Health Sciences, Gaziantep Islamic Science and Technology University, Gaziantep, Turkey E-mail: gungormusz@yahoo.co.uk

### Abstract

**Objective:** This study was conducted to investigate the quality and readability of Turkish and English dental implant related websites.

**Material and Methods:** An Internet search was done with search terms English “Dental Implant” and Turkish “Dental Implant” and a total of 100 websites were included in the final analysis. The quality of websites was assessed with four different quality tools. Readability levels of English texts were evaluated with six different readability formulas constructed for English and the readability levels of Turkish texts were evaluated with two readability formulas constructed for Turkish.

**Results:** It was determined that the quality scores were generally higher in Turkish websites than in English websites, and there was a statistical difference between Turkish and English websites ( $p < 0.05$ ). It was observed that both readability levels of Turkish and English websites were 8th grade or higher.

**Conclusions:** Quality scores were generally higher in Turkish websites than in English websites, and both Turkish and English websites were of low quality and readability levels of them were 8th grade or higher, thus quite difficult to read or to be understood and the quality, and readability of Turkish and English dental implant related online texts need to be improved.

**Keywords:** Dental Implant, Web-Based Information, Readability.

### Introduction

The Internet has become a favored source to find health information. Worldwide, about 4.5% of all Internet searches are for health-related information (Morahan-Martin 2004). Health information is more and more available on Internet with the continuous growing of medical information and communication technology. While many of them are intended for health professionals, more and more websites directly address the population with a view to providing information about health

problems, self-care and prevention. However, the rapid development of medical information on the Internet raises the issue of its quality, and of potential dangers related to its erroneous or unsuitable use (Benigeri & Pluye 2003). That is, it is not known how accurate, reliable and quality of this information. It is also a quite important public health issue that information presented on online health is accurate, reliable and understandable. Because, all individuals who have different levels of

education and culture from these sources, i.e. people from all walks of society, benefit.

On the other hand, parallel to the advances in dental implantology, the use of dental implants has become increasingly widespread. Thereby, with the increasing of the number of dental implant patients, the demand for online information HAS started to increase. It is known that these patients generally seek online information on many topics such as implant treatment, indications and contraindications, preoperative, operative and postoperative problems before consulting their dentists (Pjetursson & Heimisdottir 2018). The aim of this study is to investigate the quality and readability of Turkish and English dental implant related websites.

### Material and Methods

**Selection of Websites:** The Google search engine was used to identify websites. The search term for English language was “Dental Implant” and for Turkish language it was “Dental Implant”. The first 50 websites identified using each search term were selected, and a total of 100 websites were included in the final analysis.

**Inclusion and Exclusion:** Websites containing irrelevant content, duplicate websites, and sites requiring an account and/or payment to view the content, discussion forums, scientific articles or book reviews, PowerPoint presentations and video feeds were excluded. Sites that fulfilled the inclusion criteria were then assessed by two investigators independently and a common agreement was reached.

**Quality Assessment:** The quality of the websites was assessed using four quality assessment methods: the DISCERN instrument, Ensuring Quality Information for Patients (EQIP), the Journal of American Medical Association (JAMA) benchmarks and Information quality tool (IQT).

**Discern Instrument:** The DISCERN instrument is a reliable and valid tool for assessing the quality of written health information. The DISCERN consists of 16 questions, and these questions are categorized into three sections;

The first section (questions 1 to 8) assesses “reliability” of the publication;

The second section (questions 9 to 15) evaluates the “quality” of information about treatment choices;

The third section (question 16) evaluates “overall quality” of the publication.

Each question in instrument is evaluated on a rating scale ranging from 1 (poor quality) to 5 (excellent quality). The first section score ranges between 8 and 40. The second section score ranges between 7 and 35. The total DISCERN score ranges between 15 and 75, and low scores indicate poor quality, high scores good quality (Charnock *et al.*, 1999).

**Ensuring Quality Information for Patients (EQIP):** EQIP is a 20-item tool used to assess the reliability, validity and utility of written health information. The total EQIP score ranges from 0% to 100% and low scores indicate poor quality and high scores indicate good quality (Moult *et al.*, 2004).

**Journal of American Medical Association (JAMA) Benchmarks:** The JAMA benchmarks are used as a basic means of assessing the quality of healthcare websites, and consist of four quality measures:

- 1- “Authorship”, authors and contributors, relevant affiliations and credentials;
- 2- “Attribution”, list of references and sources of information;
- 3- “Disclosure”, website ownership, financing, advertising, and conflicts of interest to be fully disclosed;
- 4- “Currency”, content of the published and updated dates.

Each item requires a yes (1 point) or no (0 point) answer. The total JAMA score ranges between 0 and 4 (Silberg *et al.*, 1997).

**Information Quality Tool (IQT):** IQT is a 21-item tool used to evaluate the quality of information on the Internet. This scale includes items relation to “authorship” (items 1-7), “sponsorship” (items 8-10), “currency” (items 11-13, 16), “accuracy” (items 14-15, 17), “confidentiality” (item 18) and “navigability” (items 19-21). Each item requires a yes (1 point) or no (0 point) answer. The scores for these items ranges between 0 and 7 for "authorship", 0 and 3 for "sponsorship", 0 and 4 for "currency", 0 and 3 for "accuracy", 0 and

1 for "confidentiality", 0 and 3 for "navigability". Total score is varied 0 to 21 and low scores indicate poor quality, high scores good quality (Ademiluyi *et al.*, 2003, Irwin *et al.*, 2011).

**Readability Assessment:** The readability levels of English written websites were assessed using Flesch Reading Ease Formula (FRES), Flesch-Kinkaid Reading Grade Level (FKRGL), Gunning Frequency of Gobbledygook (FOG), SMOG Index (SMOG), Coleman–Liau Index (CLI) and Automated Readability Index (ARI). The readability levels of Turkish written websites were assessed using Cetinkaya-Uzun Readability Formula (CURF) and Atesman Readability Formula (ARF) (Table 1) (Kher *et al.*, 2017, Jayaratne *et al.*, 2014, Eltorai *et al.*, 2015).

The readability scores of English written websites were calculated automatically with an online readability calculator (<https://www.webpagefx.com>). The accuracy of the online method was checked using the readability formulas in Table 1. The Readability scores of Turkish written websites were calculated manually using the readability formulas in Table 1. However, some linguistic and/or lexical items such as number of characters, number of words, number of sentences, average number of characters per word, average number of words per sentence needed to assess the readability levels Turkish written websites were determined with online Readability Calculators (<https://www.webpagefx.com> and <https://www.online-utility.org>). FRES score is

categorized as very difficult (college graduate level) (scores 0-29); difficult (30-49); fairly difficult (50-59); standard (60-69); fairly easy (70-79); easy (80-89); and very easy (90-100). FKRGL scale is categorized as easy ( $\leq$ 6th-grade level) or difficult ( $\geq$ 10th-grade level) to read. The ideal FOG index score is 7 or 8, with a score above 12 accepted as very difficult for most people. ARF score is categorized as very complicated (scores 1-29); difficult (30-49); quite difficult (50-69); easy (70-89); and very easy (90-100). CURF score is categorized as "Frustration Level" (10<sup>th</sup>, 11<sup>th</sup> and 12<sup>th</sup> grade) (scores 0-34); "Instructional Reading" (8<sup>th</sup>, 9<sup>th</sup> grade) (scores 35-50); and "Independent Reading" (5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> grade) (scores 51+), (Table 2). "The Frustration Reading Level", it is the level that a reader cannot process and make sense of the text over their cognitive level even with the help of an educator. "The Instructional Reading Level"; it is level that reader can process and make sense of the text with the help of an educator. "The Independent Reading Level"; it is the level that reader can process and make sense of the text without any help (Cetinkaya & Uzun 2010, Mert 2013 ).

**Statistical analysis:** Data were analyzed with the use of the computer program, Microsoft SPSS 15.0 for Windows. Findings related to quality and readability of Turkish and English written websites were compared with the Student's t-test and with the Mann-Whitney U test. Findings related to quality measures of the JAMA were analyzed with the Chi-square test.

**Table 1. Readability tools and formulas used to calculate readability levels.**

Language and Index	Formulas
<b>English</b>	
<b>Flesch Reading Ease Formula</b>	$206.835 - (1.015 \times \text{Average number of words per sentence}) - (84.6 \times \text{Average number of syllables per word})$
<b>Flesch-Kinkaid Reading Grade Level</b>	$(0.39 \times \text{Average number of words per sentence}) + (11.8 \times \text{Average number of syllables per word}) - 15.59$
<b>Gunning Frequency of Gobbledygook</b>	$0.4 \times (\text{Average sentence length} + \text{Percentage of complex words})$

<b>SMOG Index</b>	3 + Square root of polysyllable count per 30 sentences
<b>Coleman–Liau Index</b>	0.0588 x (Average number of letters per 100 words) - 0.2969 (average number of sentences per 100 words) - 15.8
<b>Automated Readability Index</b>	4.71 x (Number of letters per word) + 0.59 (Number of words per sentence) - 21.43
<b>Turkish</b>	
<b>Cetinkaya-Uzun Readability Formula</b>	18.823 - (25.987 x Average number of syllables per word) - (0.971 x Average number of words per sentence)
<b>Atesman Readability Formula</b>	198.825 - (40,175 x Average number of syllables per word) - (2.610 x Average number of words per sentence)

**Table 2. Readability scores, readability levels and education levels of each readability tools.**

	<b>Readability Score</b>	<b>Readability Level</b>	<b>Education Level</b>
<b>English</b>			
<b>FRES scores</b>	90–100	Very easy	5 <sup>th</sup> years
	80–89	Quite easy	6 <sup>th</sup> , 7 <sup>th</sup> years
	70–79	Easy	-
	60–69	Standard	8 <sup>th</sup> to 9 <sup>th</sup> years
	50–59	Quite difficult	10 <sup>th</sup> , 12 <sup>th</sup> years
	30–49	Difficult	13 <sup>th</sup> , 16 <sup>th</sup> years
	0–29	Very complicated	University
<b>FKRGL Scores</b>		Easy	≤6 <sup>th</sup> grade
		Difficult	≥10 <sup>th</sup> grade
<b>Turkish</b>			
<b>ARF score</b>	90–100	Very easy	
	70–89	Easy	
	50–69	Quite difficult	
	30–49	Difficult	
	1–29	Very complicated	
<b>CURF score</b>	51+	Independent Reading	5 <sup>th</sup> , 6 <sup>th</sup> and 7 <sup>th</sup> grade
	35–50	Instructional Reading	8 <sup>th</sup> , 9 <sup>th</sup> grade
	0–34	Frustration Level	10 <sup>th</sup> , 11 <sup>th</sup> and 12 <sup>th</sup> grade

## Results

### Quality

**DISCERN Instrument:** The results of related to DISCERN Instrument are shown in Table 4. Scores for the three components of the DISCERN were 18.54 (2.801) for reliability (low reliability), 12.2 (3.225) for quality (low quality) and 3.08 for overall quality (high quality) in English web pages, and in Turkish web pages they were 20.36 (2.570) for reliability (low reliability), 11.44 (3.424) for quality (low quality) and 3.24 (0.847) for overall quality (high quality). Reliability scores were higher in Turkish websites than in English websites and there was a statistical difference between Turkish and English websites in term of reliability ( $t=3.386$ ,  $p=0.001$ ). There was no statistical difference between Turkish and English websites in term of quality, overall and total score of DISCERN ( $p>0.05$ ). According to DISCERN total scores, it could be said that both Turkish and English web pages was of low quality (Table 3).

**EQIP:** The mean (SD) EQIP score for English websites was 41.00 (8.349) and in Turkish websites it was 44.33 (8.149), and there was a statistical difference between Turkish and English websites ( $t=2.015$ ,  $p=0.047$ ). According to these data, it could be said that both Turkish and English web pages was of low quality (Table 3).

**JAMA:** The results in relation to the JAMA benchmarks are shown in Table 3. JAMA scores for both Turkish and English websites were very low, and there was no statistical difference between Turkish and English websites in term of authorship and JAMA scores ( $p>0.05$ ). However, there was a statistical difference between Turkish and English websites in term of disclosure and currency ( $X^2=9.722$ ,  $p=0.002$ ;  $X^2=4.332$ ,  $p=0.037$ , respectively).

**IQT:** There was no statistical difference between Turkish and English websites in term of authorship, sponsorship and confidentiality ( $p>0.05$ ). The mean (SD) IQT score for English websites was 4.84 (2.817) and for Turkish English websites it was 6.72 (3.338), and there was a statistical difference between two groups ( $t=3.044$ ,  $p=0.003$ ) (Table 4). In

addition, there was a statistical difference between groups in term of currency, accuracy and navigability ( $t=5.721$ ,  $p=0.0001$ ;  $t=2.363$ ,  $p=0.0001$  and  $t=3.377$ ,  $p=0.0001$ , respectively). The mean (SD) currency score for English websites was 2.32 (0.551), and in Turkish websites it was 3.04 (0.699). The mean (SD) accuracy score for English websites was 1.40 (1.278), and in Turkish websites it was 2.00 (1.262). The mean (SD) Navigability score for English websites was 0.44 (0.501), and in Turkish websites it was 0.88 (0.773) (Table 3). These findings show that both Turkish and English websites were of low quality.

### Linguistic features of Turkish and English web pages

General lexical and/or linguistic features of Turkish and English web pages are shown in Table 3. There was no statistical difference between Turkish and English websites in term of character and sentence counts and average number of letters per word ( $p>0.05$ ).

The mean (SD) word count in English written websites was 839.90 (665.530) and for Turkish it was 592.12 (328.265), and the mean (SD) complex word count in English websites was 111.48 (88.579) and for Turkish it was 233.34 (146.172) and there was a statistical difference between Turkish and English websites in term of word count ( $U=963$ ,  $p=0.048$ ) and complex words count ( $U=470$ ,  $p=0.0001$ ).

There was a statistical difference between two languages in term of percentage of complex words and polysyllable ( $t=0.0$ ,  $p=0.0001$ ;  $U=2.259$ ,  $p=0.0001$ , respectively). Percentage of complex words in English websites was 13.14 (2.262), and in Turkish websites it was 37.72 (3.612). Percentage of polysyllables in English websites was 12.371 (8.207), and in Turkish websites it was 37.933 (28.165).

There was a statistical difference between two languages in term of the average number of words and characters per sentence and average number of syllables per word. ( $t=5.689$ ,  $p=0.0001$ ;  $t=2.868$ ,  $p=0.005$ ;  $U=0.0$ ,  $p=0.0001$ , respectively). The average (SD) number of words per sentence in English websites was 16.920 (2.958), and in Turkish websites it was 13.678 (2.733). The average (SD) number of

characters per sentence in English websites was 81.798 (18.999), and in Turkish websites it was 93.927 (23.091). The average number of syllables per word in English written websites was 1.562 and for Turkish it was 2.343.

**Readability**

Although there was a statistical difference between Turkish and English websites in term of readability tools (FRES, FKRGL, FOG, SMOG, CLI, ARI, CURF and ARF) as seen in Table 4, these analyses were not taken into consideration.

For English written web pages, the mean (SD) FRES score was 57,604 (6,789). Therefore, the web sites screened were considered quite

difficult to read (10<sup>th</sup>, 12<sup>th</sup> years). The mean FKRGL, FOG, SMOG, CLI and ARI scores (SD) were 9,420 (1,428), 11,720 (1,434), 8,660 (0,988), 12,986 (1,349) and 10,072 (1,827), respectively. According to these readability tools, English web sites were considered difficult or quite difficult to read (8<sup>th</sup> to 12<sup>th</sup> years) (Table 4).

For Turkish written web pages, the mean CURF and ARF scores (SD) were 44,642 (4,404) and 68,977 (9,416), respectively. According to CURF, Turkish written websites were Instructional Reading level (8<sup>th</sup> to 12<sup>th</sup> years), and according to ARF it was quite difficult to read.

**Table 3. Website quality content based on DISCERN and EQIP, Journal of the American Medical Association (JAMA) benchmarks, Information Quality Tool (IQT)**

			English	Turkish	U/ X <sup>2</sup> / t	P
<b>DISCERN</b>						
<b>Reliability</b>	8-40	Mean (SD)	18.54 (2.801)	20.36 (2.570)	t=3.386	0.001
<b>Quality</b>	7-35	Mean (SD)	12.26 (3.225)	11.44 (3.424)	t=1.233	>0.05
<b>Overall</b>	1-5	Mean (SD)	3.08 (0.900)	3.24 (0.847)	t=0.916	>0.05
<b>Total Score</b>	15-75	Mean (SD)	30.80 (4.961)	31.80 (4.777)	t=1.027	>0.05
<b>EQIP</b>						
<b>Total Score</b>	0%-100%	Mean (SD)	41.00 (8.349)	44.33 (8.194)	t=2.015	0.047
<b>JAMA</b>						
<b>Authorship</b>	Yes n(%)		8 (16)	9 (18)	X <sup>2</sup> =0.071	>0.05
	No n(%)		42 (84)	41 (82)		
<b>Attribution</b>	Yes n(%)		-	-	-	-
	No n(%)		-	-		
<b>Disclosure</b>	Yes n(%)		21 (42)	7 (14)	X <sup>2</sup> =9.722	0.002
	No n(%)		29 (58)	43 (86)		
<b>Currency</b>	Yes n(%)		3 (6)	10 (20)	X <sup>2</sup> =4.332	0.037
	No n(%)		47 (94)	40 (80)		
<b>Total Score</b>	1-4	Mean (SD)	0.64 (0.776)	0.52 (0.677)	U=1155	>0.05
<b>IQT</b>						
<b>Authorship</b>	0-7	Mean (SD)	0.36 (0.985)	0.60 (1.578)	t=0.912	>0.05
<b>Sponsorship</b>	0-3	Mean (SD)	0.28 (0.454)	0.20 (0.404)	t=0.931	>0.05

<b>Currency</b>	0-4	Mean (SD)	2.32 (0.551)	3.04 (0.699)	t=5.721	0.0001
<b>Accuracy</b>	0-3	Mean (SD)	1.40 (1.278)	2.00 (1.262)	t=2.363	0.0001
<b>Confidentiality</b>	0-1	Mean (SD)	0.04 (0.198)	0	U=1200	>0.05
<b>Navigability</b>	0-3	Mean (SD)	0.44 (0.501)	0.88 (0.773)	t=3.377	0.0001
<b>Total Score</b>	0-21	Mean (SD)	4.84 (2.817)	6.72 (3.338)	t=3.044	0.003

**Table 4. General characteristics of Turkish and English web pages and Readability levels calculated by Flesch Reading Ease Formula (FRES), Flesch-Kinkaid Reading Grade Level (FKRGL), Gunning Frequency of Gobbledygook (FOG), SMOG Index (SMOG), Coleman-Liau Index (CLI), Automated Readability Index (ARI), Cetinkaya-Uzun Readability Formula (CURF), Atesman Readability Formula (ARF).**

	<b>English</b>	<b>Turkish</b>		
	<b>Mean (SD)</b>	<b>Mean (SD)</b>	<b>t / U</b>	<b>P</b>
<b>Number</b>				
<b>Characters</b>	4149.82 (3134.591)	3982.24 (2150.801)	t=0.312	>0.05
<b>Sentences</b>	50.80 (38.778)	45.48 (26.795)	t=0.798	>0.05
<b>Words</b>	839.90 (665.530)	592.12 (328.265)	U=963	0.048
<b>Complex Words</b>	111.48 (88.579)	233.34 (146.172)	U=470	0.0001
<b>Percentage</b>				
<b>Complex Words</b>	13.14 (2.262)	37.72 (3.612)	U=0.0	0.0001
<b>Polysyllables</b>	12.371 (8.207)	37.933 (28.165)	U=295	0.0001
<b>Averages</b>				
<b>Words Per Sentence</b>	16.920 (2.958)	13.678 (2.733)	t=5.689	0.0001
<b>Characters Per Sentence</b>	81.798 (18.999)	93.927 (23.091)	t=2.868	0.005
<b>Letters Per Word</b>	5.613 (5.717)	6.874 (1.276)	t=1.522	>0.05
<b>Syllables Per Word</b>	1.562 (0.072)	2.343 (0.106)	U=0.0	0.0001
<b>Readability</b>				
<b>FRES</b>	57.604 (6.789)	5.366 (10.320)	U=0.0	0.0001
<b>FKRGL</b>	9.420 (1.428)	17.404 (1.900)	U=1	0.0001
<b>FOG</b>	11.720 (1.434)	19.882 (2.191)	U=2	0.0001
<b>SMOG</b>	8.660 (0.988)	13.054 (1.591)	U=11.5	0.0001
<b>CLI</b>	12.986 (1.349)	19.956 (1.689)	t=22.793	0.0001
<b>ARI</b>	10.072 (1.827)	14.010 (2.130)	t=9.921	0.0001
<b>CURF</b>	61.746 (3.363)	44.642 (4.404)	U=1	0.0001
<b>ARF</b>	91.773 (8.096)	68.977 (9.416)	t=12.809	0.0001

## **Discussion**

The use of dental implants has become increasingly widespread, and is nowadays the most common dental procedure applied to rehabilitate problems arising from tooth loss. Along with increasing number of dental implant patients, the demand for online information has increased. Thus, people seek online information about dental implants, surgical procedures, operative or postoperative problems, prosthetic restorations, etc. Therefore, it is very important that this information is readable and good quality. This study was made with aim to assessment of the quality and readability of Turkish and English web-based dental implant information. To our knowledge, this is the first study that the quality and readability of Turkish and English websites is comparatively analyzed and used many readability and quality assessment tools.

In this investigation, the quality of websites were assessed with the DISCERN instrument, EQIP, JAMA benchmarks and IQT. According to analysis made, there was no difference important factor in understanding texts. Readability is defined as the ease of reading words and sentences. Readability is calculated by a mathematical formula considering parameters such as counts of characters, sentences and words, averages of characters per sentences, words per sentences and characters per word, etc. In this investigation, there was no statistical difference between Turkish and English websites in term of the character and the sentence counts and the average number of letters per word. The mean word and the complex word count in English written websites were 839.90 and 111.48, respectively, and in Turkish they were 592.12 and 233.34, respectively; percentage of complex words and the polysyllables in English websites was 13.14 and 12.371, respectively and in Turkish websites they were 37.72 and 37.933, respectively; the average number of words and characters per sentence and the average number of syllables per word in English websites was 16.920, 81.798 and 1.562, respectively and in Turkish they were 13.678, 93.927 and 2.343, respectively. It was determined that there were significant

between Turkish and English websites in term of DISCERN and JAMA scores. The EQIP and IQT values and the values of some components of DISCERN, IQT and JAMA except for disclosure which is one of components of JAMA were higher in Turkish websites than in English websites. In addition, there was a statistical difference between Turkish and English websites in term of the EQIP, IQT, the “reliability” which is one of sections of DISCERN, “disclosure” and “currency” which are sections of JAMA, and “currency”, “accuracy”, “navigability” which are sections of IQT. The mean DISCERN, EQIP and IQT scores for English websites were 31.80, 41.00 and 4.84, respectively, and in Turkish websites they were 30.80, 44.33 and 6.72, respectively. The mean JAMA scores for both Turkish and English websites were very low. According these findings, it can be said that both Turkish and English dental implant related websites were of low quality.

On the other hand, as well as the quality of a written text, its readability is also a very differences between two languages in term of these lexical or linguistic features. These data indicate that both languages have clearly specific linguistic features. As relation this matter, it is stated that a readability formula developed for a certain language can provide invalid results in the determination of the readability of texts in other languages, and thus cannot be applied to texts in the another languages (Cetinkaya & Uzun 2010, Ulusoy 2006). In our study, although there is a statistical difference between Turkish and English websites in term of readability tools, these analyses were not taken into consideration for the mentioned reasons above. Kuo et al, (2010) in their study, analyzed FKRGL, SMOG and ARI scores to assess the readability of Taiwanese texts, and they determined that these readability tools did not find directly applicable for predicting readability of Taiwanese texts. In a study made by Kose (2009), it has been evidently ascertained that the FOG and FRES formulas provide invalid results in the determination of the readability of Turkish texts. Cepni *et al.*, (2002) applied the FRES, FOG, SMOG and



FRY formulas to evaluate the readability levels of Turkish textbooks and they observed that these formulas could not provide valid results for the Turkish textbooks.

As in our study, the readability levels of English texts are generally assessed with readability formulas such as FRES, FKRGL, FOG, SMOG, CLI and ARI. Readability assessments for Turkish are done using metrics similar to the ones constructed for English and the readability levels of Turkish texts have been evaluated with readability formulas such as CURF and ARF (Cetinkaya & Uzun 2010, Atesman 1997). In the present investigation, the mean FRES score was 57,604 and the FKRGL, FOG, SMOG, CLI and ARI scores ranged from 9 to 12, that is, English written web pages were difficult or quite difficult to read. The mean CURF and ARF scores were 44,642 and 68,977, respectively. According to CURF, Turkish written websites were "Instructional Reading level" (8th to 12th years), and according to ARF it was quite difficult to read.

Jayaratne *et al.*, (2014) performed a study to assess readability of patient-oriented English written online information on dental implants. Similar to our study, they used FKRGL, FOG, SMOG, CLI and ARI readability tools to assess readability levels of website. In their study, they determined that the mean FRES score was 49.04 and the average readability grade level was 11.65. In addition, they reported that all the websites related to dental implants were written well above the grade level recommended for patients, and most of these sites were difficult to read.

In another study made by Leira-Feijoo *et al.*, (2015) with the aim to assess the quality of patient-addressed, dental implants-related English written websites in terms of reliability, accessibility, usability and readability, quality of websites were analyzed with the DISCERN and the LIDA instruments and legibility was assessed with the FRES and FKRGL. They determined that the median score for the DISCERN instrument was 3, and indicated serious or potentially important shortcoming in the quality of the information obtained, and

LIDA scores showed modest percentages for accessibility and intermediate for usability and reliability. In addition, they determined that the mean FRES score was 51.72 and the mean FKRGL score was 12.76, and they concluded that available e-health information on dental implants was difficult to read for the average patient and poor in terms of quality.

However, similar to our investigation, in studies made in the other disciplines of dentistry, investigators reported that information on the internet is of low quality and difficult to read (Jayaratne *et al.*,2014, Leira-Feijoo *et al.*,2015, Schwendicke *et al.*,2017, Ni Riordain & Hodgson 2014, Lee *et al.*,2019, Svider *et al.*,2013, Jo *et al.*,2018). In addition, the American Medical Association and National Institutes of Health recommend presenting patient education materials (PEMs) at the fourth- to sixth-grade level. A key aspect of literacy is readability, or the ease with which written materials are read. Material is considered easy to read if written below the sixth-grade level; of average difficulty if written between the seventh- and ninth-grade levels; and difficult if written above the ninth-grade level (Walsh & Volsko 2008).

As a result, it was determined that the quality scores were generally higher in Turkish websites than in English websites, and there was a statistical difference between Turkish and English websites. However, it was observed that both Turkish and English dental implant related websites were of low quality and readability levels were 8th grade or higher, thus quite difficult to read or to be understood and the quality, and readability of Turkish and English dental implant related online texts need to be improved.

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