Original Article

Quality and Readability Assessment of Websites Related to Dental Implantation

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Abstract

Objective- This study was conducted to investigate the quality and readability of dental implant related websites.
Methods- An Internet search was done with eight search terms related to dental implantation. The first 30 websites identified using each search term were selected, and a total of 240 websites were included in the final analysis. The quality of websites were assessed with the DISCERN instrument, the Ensuring Quality Information for Patients (EQIP), the Journal of American Medical Association (JAMA) benchmarks and the Information quality tool (IQT); readability levels were evaluated with and the Flesch Reading Ease Formula (FRES), the Flesch-Kinkaid Reading Grade Level (FKRGL), the Gunning Frequency of Gobbledygook (FOG), the SMOG Index (SMOG), the Coleman-Liau Index (CLI) and the Automated Readability Index (ARI).
Findings- The mean DISCERN, EQIP, JAMA and IQT scores were 30.76, 42.52, 0.47 and 5.43, respectively. The mean scores for FRES, FKRGL, FOG, SMOG and CLI scores were 52.26, 10.49, 12.78, 9.45 and 13.40, respectively.
Conclusions- It was determined that dental implantation related websites were low quality, and readability level was 9th grade or higher and thus quite difficult to read or to be understood.
Practice Implications- The quality and readability of dental implant related websites need to be improved.
Originality/value- Dental implant treatment is one of the most frequently used treatment methods for restoration of problems arising from of tooth loss and patients generally seek online information on this topic. In this study, the quality and readability of dental implant related websites were evaluated and It was determined that these websites were low quality and quite difficult to read or to be understood.

Keywords: Dental Implant, Web-Based Information, Readability

Introduction

Significant progress has been made in recent years in information and communication technology, and all indications are that these technological progress and use of information and communication technology will continue at a rapid pace. Internet, which is the most important part of these progressions, has been became one of the indispensable elements of the lives nowadays. Through the internet, people can access all the information they need in the fastest way and they can get to knowledge immediately about the developments in the farthest corner of the world. In addition to these outstanding features it offers to its users, the internet is an indispensable source of

information with its rich content. For this reason, people can apply to the resources on the internet in every subject they want, and they can benefit from these sources easily (Diaz *et al.*, 2002; Moretti *et al.*2012). However, it is not known how accurate, reliable and quality of information presented on internet are. Furthermore, it is quite important to have a written text or source to be quality and easily understandable or readable, no matter how accurate and reliable. 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, dental implant treatment is one of the most frequently used treatment methods for restoration of problems arising from of tooth loss. Today, in parallel to the advances in dental implantology, use of dental implants has become considerably more and more widespread, and with the increasing of the number of implant patients, the demand for online information has started to increase. Like other patients, it is known that these patients generally seek online information on many topics such as implant treatment, indications, contraindications, preoperative, operative and postoperative problems before consulting their dentists (Pjetursson and Heimisdottir, 2018). However, it is not made much study on the quality and readability of dental implantation related online information. The aim of this study is to investigate the quality and readability of dental implant related websites.

Materials and methods

Selection of Websites: Google.com as search engine was used to identify websites. Eight search terms "Dental Implant", "Dental Implant, Surgery", "Dental Implant, Advantages", "Dental Implant, Indications/Contraindications", "Dental Implant, Complications", "Dental Implant, Bone Grafting", "Dental Implant, Restorations", "Sinus Augmentation" were used in this study. The first 30 websites identified using each search term were selected, and a total of 240 websites were included in the final analysis.

Inclusion and Exclusion: Websites containing irrelevant content, duplicate websites, sites not written in English and 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 is calculated by summing the scores for items 1 to 8 and this section score ranges between 8 and 40; the second section score is calculated by summing the scores for items 9 to 15 and this section score ranges between 7 and 35. Because there is only single question in the third section (question 16), this section score ranges between 1 and 5. The total DISCERN score is calculated by summing the scores for items 1 to 15 and the total 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 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 scores were calculated automatically with an online Readability Calculator (https://www.webpagefx.com). Texts selected and cut from each website were pasted on this site. In addition, the accuracy of the online method was checked using the following readability formulas:
FRES = 206.835 - (1.015 x Average number of words per sentence) - (84.6 x Average number of syllables per word);
FKRGL = (0.39 x Average number of words per sentence) + (11.8 x Average number of syllables per word) - 15.59;
FOG = 0.4 x (Average sentence length + Percentage of complex words);
SMOG = 3 + Square root of polysyllable count per 30 sentences;
CLI = 0.0588 x (Average number of letters per 100 words) - 0,296 9 (average number of sentences per 100 words) - 15.8;
ARI = 4.71 x (Number of letters per word) + 0.5 9 (Number of words per sentence) - 21.43.

FRES indicates the readability of the texts, and the other readability tools are related to the educational level of the individual and estimate the years of education the reader requires to understand the text. 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 (≤6th-grade level) or difficult (≥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 (Kher *et el.*, 2017; Jayaratne *et el.*, 2014; Eltorai *et al.*, 2015).

Statistical analysis: Descriptive statistics were calculated for all variables and the correlation between readability and quality scores was determined using Pearson’s correlation coefficient.

Results

Quality

DISCERN Instrument and EQIP: The results of related to DISCERN and EQIP are shown in Table 1. Scores for the three domains of the DISCERN were 19.81 (3.21) for reliability (moderate reliability), 10.95 (3.15) (low quality) for quality and 3.08 (high quality) for overall quality (range 2.60-3.50). The mean (SD) DISCERN score for all websites was 30.76 (4.99), therefore websites screened were considered with low quality. Reliability score was highest in the web sites screened with "Dental Implant + Complications" terms and lowest in "Sinus Augmentation". Quality score was highest in the web sites screened with "Dental Implant + Indications/Contraindications” terms and lowest in "Dental Implant + Restorations”. Overall quality score was highest in the web sites screened with "Dental Implant + Complications" terms and lowest in "Dental Implant + Bone Grafting" (Table 1). The mean (SD) EQIP score for all websites was 42.52 (8.70), and EQIP score (Mean (SD)) was highest for the

"Dental Implant + Complications" terms (45.42 (10.05)) and lowest for the "Sinus Augmentation" terms (39.72(6.44)). This data showed that websites screened were low quality (Table 1).

JAMA: The results in relation to the JAMA benchmarks are shown in Table 2. The mean (SD) JAMA score for all websites was 0.47 (0.81) (very low score). According to the JAMA benchmarks criteria, authorship was displayed in 19.6 % of the total sites, 15.8 % of currency, 9.2 % of disclosure and 2.5 % attribution (Table 2).

IQT: The mean (SD) IQT score for all websites was 5.43 (3.05) (low score). For those sites, mean authorship score was 0.55 (1.37) (very low quality), mean sponsorship score was 0.08 (0.27) (very low quality), mean currency score was 2.60 (0.69) (moderate quality), mean accuracy score was 1.63 (1.105) (moderate quality), and median navigability score was 0.55 (0.64) (low quality) (Table 3).

Readability: A total of 240 websites meeting the selection criteria were included in the study and descriptive statistics of readability for these websites are shown in Table 4.The mean (SD) FRES scores were ranged from 52.77 (9.58) to 57.34 (6.33) except for the web sites screened with "Dental Implant + Indications/Contraindications" terms (37.09 (14.57)), and the mean score for all websites was 52.26 (10.85). Therefore, the web sites screened with "Dental Implant + Indications/Contraindications" terms were considered difficult to read, and the other web sites were considered quite difficult to read (Table 4).FKRGL, FOG and SMOG scores were highest in sites screened with "Dental Implant + Indications/Contraindications" terms and lowest that for "Dental Implant" terms. The mean scores (SD) for FKRGL, FOG and SMOG were 10.49 (2.19), 12.78 (2.22) and 9.45 (1.63), respectively (Table 4). The mean (SD) CLI score for all websites was 13.40 (1.93). CLI score was highest in the web sites screened with "Dental Implant + Indications/ Contraindications" terms (15.68 (2.47)), followed by "Dental Implant + Restorations" 14.05 (1.59), and lowest in "Sinus Augmentation" 12.09 (1.38) (Table 4). The mean (SD) ARI scores for search terms were in a range between 10.08 (1.75) and 14.51 (16.91), and the mean (SD) score for all websites was 11.93 (8.72). ARI score was highest in the web sites screened with "Dental Implant + Bone Grafting" terms and lowest in that for "Dental Implant" terms (Table 4).

All these readability tools showed that the websites screened were difficult or very difficult to read.

The Correlation between Quality and Readability Tools Scores: No significant correlation was found between the DISCERN and EQIP scores and readability tools. However, FRES scores showed a positive correlation with "disclosure" that is a component of the JAMA ($r=0,137$; $p<0.05$), "sponsorship" ($r=0.129$; $p<0.05$) and "currency" that are components of the IQT($r=0.151$; $p<0.05$). FKRGL scores showed a negative correlation with "disclosure" that is a component of the JAMA ($r=-0.139$; $p<0.05$). CLI scores showed a negative correlation with JAMA scores ($r= -0.150$; $p<0.05$), "currency" that is a component of the JAMA ($r= -0.159$; $p<0.05$), IQT scores ($r= -0.128$; $p<0.05$) and "sponsorship", "currency" and "accuracy" that are components of the IQT, ($r= -0.136$; $p<0.05$), ($r= -0.211$; $p<0.001$) and ($r= -0.133$; $p<0.05$), respectively. ARI scores showed a negative correlation with disclosure that is a component of the JAMA ($r= -0.167$; $p<0.001$) and sponsorship that is a component of the IQT ($r= -0.164$; $p<0.05$). ARI scores showed a negative correlation with disclosure that is a component of the JAMA ($r= -0.167$; $p<0.001$) and "sponsorship" that is a component of the IQT ($r= -0.164$; $p<0.05$), (Table 5).

Table 1. Website quality content based on DISCERN instrument.

	Reliability Mean(SD)	Quality Mean(SD)	Overall Mean(SD)	Total Mean(SD)	EQIP Mean(SD)
Dental Implant	19.03(3.01)	12.23(3.66)	3.17(0.91)	31.27(5.62)	40.83(8.78)
Surgery	20.20(3.21)	10.27(3.03)	3.47(0.86)	30.47(5.46)	43.33(9.25)
Advantages	20.87(3.81)	11.73(2.72)	3.37(0.89)	32.60(4.86)	42.22(10.48)
Ind-Contraindication	19.10(2.42)	11.80(3.86)↑	3.10(0.80)	30.90(4.75)	43.19(8.78)

Complications	21.97(4.30)↑	10.73(2.88)	3.50(0.77)↑	32.70(4.93)↑	45.42(10.05)↑
Bone Grafting	20.50(3.20)	11.53(3.55)	2.60(0.85)↓	32.03(5.68)	43.33(9.63)
Restorations	18.73(0.64)	9.13(1.85)↓	2.93(0.45)	27.87(1.87)↓	42.08(4.14)
Sinus Augmentation	18.07(1.98)↓	10.20(2.18)	2.50(0.82)	28.27(3.61)	39.72(6.44)↓
Total	19.81(3.21)	10.95(3.15)	3.08(0.87)	30.76(4.99)	42.52(8.70)

↑; highest score. ↓; lowest score

Table 2. Website quality content based on Journal of the American Medical Association (JAMA) benchmarks.

	Authorship n (%)	Attribution n (%)	Disclosure n (%)	Currency n (%)	JAMA Mean(SD)
Dental Implant	7 (23.3)	-	10 (33.3)	2 (6.7)	0.63(0.81)
Surgery	6 (20)	-	9 (30)	7 (23.3)	0.73(0.94)
Advantages	7 (23.3)	1 (3.3)	1 (3.3)	5 (16.7)	0.47(0.94)
Ind-Contraindication	3 (10)	-	-	6 (20)	0.3(0.65)
Complications	12 (40)	4 (13.3)	1 (3.3)	12 (40)	0.97(10)
Bone Grafting	7 (23.3)	1 (3.3)	1 (3.3)	5 (16.7)	0.819(0.15)
Restorations	3 (10)	-	-	-	0.305(0.06)
Sinus Augmentation	2 (6.7)	-	-	1 (3.3)	0.10(0.30)
Total	47 (19.6)	6 (2.5)	22 (9.2)	38 (15.8)	0.47(0.81)

Table 3. Website quality content based on Information Quality Tool (IQT)

	Authorship Mean (SD)	Sponsorship Mean (SD)	Currency Mean (SD)	Accuracy Mean (SD)	Navigability Mean (SD)	Total Mean (SD)
Dental Implant	0.47(1.04)	0.17(0.37)	2.23(0.50)	0.97(1.27)	0.30(0.46)	4.13(2.84)
Surgery	0.87(1.77)	0.33(0.47)	2.50(0.68)	1.97(0.92)	0.70(0.46)	6.37(2.96)
Advantages	0.93(1.91)	0.03(0.18)	2.63(0.76)	1.80(1.21)	0.60(0.81)	6.00(4.04)
Ind-Contraindication	0.43(1.33)	0.00	2.37(0.71)	1.07(1.04)	0.40(0.67)	4.37(3.10)
Complications	1.17(1.80)	0.03(0.18)	3.03(0.76)	2.27(0.94)	0.70(0.46)	7.20(3.19)
Bone Grafting	0.47(1.19)	0.03(0.18)	2.80(0.76)	2.00(0.87)	0.77(0.56)	6.07(2.63)
Restorations	0.03(0.18)	0.00	2.50(0.50)	1.50(0.82)	0.37(0.49)	4.40(1.56)
Sinus Augmentation	0.07(0.25)	0.03(0.18)	2.70(0.53)	1.50(1.07)	0.57(0.93)	4.87(2.27)
Total	0.55(1.37)	0.08(0.27)	2.60(0.69)	1.63(1.10)	0.55(0.64)	5.43(3.05)

Table 4. 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).

	FRES Mean(SD)	FKRGL Mean(SD)	FOG Mean(SD)	SMOG Mean(SD)	CLI Mean(SD)	ARI Mean(SD)
Dental Implant	57.34(6.33)↑	9.39(1.39)↓	11.70(1.41)↓	8.67(0.97)↓	13.16(1.23)	10.08(1.75)↓
Surgery	53.29(8.24)	10.45(1.68)	12.87(1.79)	9.58(1.29)	12.87(1.53)	10.81(2.13)
Advantages	53.86(8.22)	9.87(2.467)	12.50(1.96)	9.20(1.43)	13.85(1.65)	11.39(2.19)
Ind-Contraindication	37.09(14.57)↓	12.98(2.81)↑	15.26(2.93)↑	11.27(2.17)↑	15.68(2.47)↑	13.62(3.30)
Complications	52.77(9.58)	10.67(1.81)	12.50(1.94)	9.09(1.62)	13.10(1.64)	11.32(2.06)
Bone Grafting	53.94(8.66)	10.83(2.10)	13.41(2.22)	9.71(1.56)	12.41(1.26)	14.51(16.91)↑
Restorations	53.99(7.93)	9.85(1.40)	11.87(1.36)	9.01(1.12)	14.05(1.59)	10.75(1.79)
Sinus Augmentation	55.81(8.03)	9.92(1.52)	12.16(1.75)	9.04(1.30)	12.09(1.38)↓	12.93(17.10)
Total	52.26(10.85)	10.49(2.198	12.78(2.22)	9.45(1.63)	13.40(1.93)	11.93(8.72)

↑; highest score. ↓; lowest score

Table 5. The Correlation between Quality and Readability Tools Scores

	FRES	FKRGL	CLI	ARI
JAMA			-0.150*	
Disclosure	0.137*	-0.139*		-0.167**
Currency			-0.159*	
IQT			-0.128*	
Sponsorship	0.129*		-0.136*	-0.164*
Currency	0.151*		-0.211**	
Accuracy			-0.133*	

*p<0.05, **p<0.001

Discussion

Dental implantation is the most preferred treatment procedure for the rehabilitation of functional, anatomical or aesthetic problems arising from partial or total tooth loss. Millions of dental implants are placed in the world every year, and along with increasing number of dental implant patients, the demand for online information has increased. Thus, many patients research online information about topics such as dental implantation, surgical procedure, operative or postoperative problems, prosthetic restorations etc. However, it was not made much study on the quality and readability of this information. This study was conducted to assess the quality and readability of websites related to dental implants. A total of 240 websites were evaluated using eight different keywords that could be used to investigate knowledge related to dental implantation. The quality of websites were assessed with the DISCERN instrument, the Ensuring Quality Information for Patients (EQIP), the Journal of American Medical Association (JAMA) benchmarks and the Information quality tool (IQT); readability levels were evaluated with and the Flesch Reading Ease Formula (FRES), the Flesch-Kinkaid Reading Grade Level (FKRGL), the Gunning Frequency of Gobbledygook (FOG), the SMOG Index (SMOG), the Coleman-Liau Index (CLI) and the Automated Readability Index (ARI).

The mean DISCERN score for all websites was 30.76. This indicated that websites were low quality. “Reliability” score, which is one of three sections of DISCERN, was highest in the web sites screened with "Dental Implant + Complications" terms and was lowest in "Sinus Augmentation". “Quality” score was highest in the web sites screened with "Dental Implant + Indications/Contraindications” terms and was lowest in "Dental Implant + Restorations”. “Overall quality” score was highest in the web sites screened with "Dental Implant + Complications" terms and was lowest in "Dental Implant + Bone Grafting". The mean JAMA, EQIP and IQT scores were 0.47, 42.52 and 5.43, respectively. Like DISCERN Instrument, these findings showed that the websites screened were low quality and revealed that the quality of the texts on the websites needs to be improved. In the evaluations made related to subgroups of the IQT, it was seen that “authorship and “sponsorship” scores of websites were very low quality, the mean “currency” and “accuracy” scores were moderate quality and the mean “navigability” score was low quality. EQIP score was highest for the “Dental Implant + Complications” terms and was lowest for the “Sinus Augmentation” terms. In addition, according to the JAMA benchmarks criteria, “authorship” was displayed in 19.6 % of the total sites, 15.8 % of “currency”, 9,2 % of “disclosure” and 2.5 % “attribution”.

On the other hand, as well as the quality of a written text, its readability is also a very important factor in understanding texts. It is known that parameters such as counts of characters, sentences and words, averages of characters per sentences, words per sentences and characters per word, etc are effective on the readability level, and complex sentences comprised of long words and long sentences may affect negatively the reader’s confidence in learning about a topic (Boztas *et al.*, 2017; Wang *et al.*, 2009). These can be more important for medical texts. Medical terminology

has its own characteristic and even if the individual's educational level is high and even sentences are simple, text may be difficult to understand for an individual who do not know medical terms. Therefore, it is important to write clearly and understandable of information presented besides be accurate of information related to topics such as health, illness, treatment options and health care services (Berland *et al.*,2001; Svider *et al.*, 2013). In this study, the mean FRES score was 52.26 and the mean FKRGL, FOG, SMOG, CLI and ARI scores were 10.49, 12.78, 9.45, 13.40 and 11.93, respectively. According to these findings, it could be said that the readability level of dental implantation-related websites was 9th grade or higher and thus quite difficult to read and revealed that the readability of the texts on the websites need to be improved. In addition, the mean FRES scores were ranged from 52.77 to 57.34. FRES scores were highest in the web sites screened with "Dental Implant" terms and lowest in that for "Dental Implant + Indications/Contraindications" terms. FKRGL, FOG and SMOG scores were ranged from 9 to 12. These scores were highest in sites screened with "Dental Implant + Indications/Contraindications" terms and lowest in that for "Dental Implant" terms. The mean ARI scores were in a range between 10.08 and 14.51. ARI scores were highest in the web sites screened with "Dental Implant + Bone Grafting" terms, and lowest in that for "Dental Implant" terms. CLI scores were highest in the websites screened with "Dental Implant + Indications/ Contraindications" terms, followed by "Dental Implant + Restorations" terms and lowest in "Sinus Augmentation" terms.

Jayaratne et al.(2014) performed a study on the total 39 websites using the keywords "Dental implant" or "Tooth Implant". Similar to our study, they used the FRES, FKRGL, FOG, SMOG, CLI and ARI indices to assess of readability level, and they found FERS to be 49.04 and the average readability grade level was 11.65. In their study, 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.10

In a study made with the aim to assess the quality of patient-addressed, dental implants-related websites in terms of reliability, accessibility, usability and readability, quality of websites were analyzed with the DISCERN and the LIDA instruments, and FRES and FKRGL were used to assess readability. In this study made by Leira-Feijoo et all., 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, authors determined that the mean FRES score was 51,72 and the mean FKRGL score was 12,76, and concluded that available e-health information on dental implants was difficult to read for the average patient and poor in terms of quality (Leira-Feijoo *et al.*, 2015).

On the other hand, in a study made with aim to evaluate the quality and readability of recurrent respiratory papillomatosis-related websites, quality of websites was assessed with the DISCERN instrument, and the readability levels were evaluated with FRES and average grade level (AGL). Authors determined that the quality and readability of websites related to recurrent respiratory papillomatosis was alarmingly poor and there was no a significant correlation between the DISCERN score and both FRES score and AGL. In addition, they noted that this means that a good-quality website was not necessarily well readable and vice versa (San Giorgi *et al.*, 2017). Similarly, in our study, there was no significant correlation between the DISCERN and EQIP scores and readability tools. In contrast, it was observed that there were significant correlations between JAMA, IQT and their some of the components and the other readability tools except for FOG and SMOG. The JAMA benchmarks have been used as a basic means of assessing the quality of healthcare websites since 1997, and consist of four quality measures: authorship, attribution, disclosure and currency. IQT has been used to evaluate the quality of information on the Internet. This scale includes items relating to authorship, sponsorship, currency, accuracy, confidentiality and navigability. FRES indicates the readability of the texts, and the other readability tools such as FKRGL, CLI and ARI are related to the educational level of the individual and estimate the years of education the reader requires to understand the text. While higher scores

of the FRES indicate texts that are easier to read, higher scores of readability tools such as FKRGL, CLI and ARI indicate texts that are more difficult to read. Interestingly, in our study, while there was a positive correlation between FRES scores and "disclosure" that is a component of the JAMA and "sponsorship" and "currency" that are components of the IQT, there was a negative correlation between CLI scores and JAMA scores, "currency" that is a component of the JAMA, IQT scores and "sponsorship", "currency", "accuracy" that are components of the IQT, between FKRGL, ARI scores and "disclosure" that is a component of the JAMA, and between ARI scores and "sponsorship" that is a component of the IQT.

As a result, it was determined that dental implantation related websites were low quality, and readability level was 9th grade or higher and thus quite difficult to read or to be understood, and the quality and readability of the texts on the websites need to be improved. In addition, it was observed that there were significant correlations between the quality tools such as JAMA, IQT and their some of the components and the readability tools such as FKRGL, ARI, especially CLI.

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