

RESEARCH

Evaluation of Quality and Readability of Online Information on Treatments of Traumatic Dental Injuries

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Selcuk Dent J, 2022; 9: 46-52 (Doi: 10.15311/selcukdentj.814290)

Başvuru Tarihi: 20 Ekim 2020
Yayına Kabul Tarihi: 01 Mart 2021

ABSTRACT

Evaluation of Quality and Readability of Online Information on Treatments of Traumatic Dental Injuries

Background: Traumatic dental injuries is a common public health issue all over the world. The aim of this study was to investigate the quality and readability of web based information regarding treatments of traumatic dental injuries.

Methods: An internet search was carried out using Google search engine with four different keywords ("treatment of broken teeth", "treatment of tooth trauma", "treatment of anterior tooth fractures in children", "fractured teeth treatments") related to treatments of traumatic dental injuries. The duplicate websites, links to research studies, advertisements, discussion groups, videos and images were excluded from the evaluation. The quality of the written information regarding treatments of traumatic dental injuries in websites were analyzed with DISCERN toolkit. The readability of the written information was evaluated with Flesch-Kincaid grade level (FKGL), Flesch-Kincaid Reading Ease (FKRE) and Simple Measure of Gobbledygook reading grade level (SMOG) index.

Results: A total of 120 webpages were identified but only 42 of them were remained after exclusion criterias. Among these websites, 25 (59.5%) of them were belonged to private dental clinics, 9 (21.4%) of them were belonged to informative pages about health and dentistry and 8 (19.1%) of them were belonged to professional organizations' websites. The average DISCERN score was 42.4 and ranged between 24 to 62. The average FKRE was 50.7 ± 14. which is equivalent to a reading level of 10th to 12nd grade. The average FKGL score for was 8.5 ± 2.8 and the average SMOG score was 7.3 ± 2.0 for all the websites.

Conclusion: : The results of the present study showed that the quality of information on the investigated websites was fair according to the DISCERN toolkit and too difficult to read and interpret for the general population. Healthcare information providers should focus on improving the quality and readability of the information regarding treatment of traumatic dental injuries.

KEYWORDS

Dental Trauma, Online Health, Readability, DISCERN, Google

ÖZ

Travmatik Diş Yaralanmalarının Tedavilerine İlişkin Çevrimiçi Bilgilerin Kalitesinin ve Okunabilirliğinin Değerlendirilmesi

Amaç: Travmatik diş yaralanmaları tüm dünyada yaygın bir halk sağlığı sorunudur. Bu çalışmanın amacı travmatik diş yaralanmalarının tedavisine ilişkin web tabanlı bilgilerin kalitesini ve okunabilirliğini araştırmaktır.

Gereç ve Yöntemler: Travmatik diş yaralanmalarının tedavileriyle ilgili dört farklı anahtar kelime ("kırık dişlerin tedavisi", "diş travmalarının tedavisi", "çocuklarda ön diş kırıklarının tedavisi", "kırık diş tedavileri") ile Google arama motoru kullanılarak bir internet araştırması gerçekleştirildi. Tekrarlanan web siteleri, araştırma çalışmalarına ait bağlantı linkleri, reklamlar, tartışma grupları, videolar ve resimler değerlendirme dışı bırakıldı. Web sitelerindeki travmatik diş yaralanmalarının tedavisine ilişkin yazılı bilgilerin kalitesi DISCERN ile analiz edildi. Yazılı bilgilerin okunabilirliği Flesch-Kincaid sınıf seviyesi (FKGL), Flesch-Kincaid Okuma Kolaylığı (FKRE) ve Simple Measure of Gobbledygook okuma notu seviyesi (SMOG) indeksleri ile değerlendirildi.

Bulgular: Toplam 120 web sayfası belirlendi, ancak hariç tutma kriterlerinden sonra bunlardan geriye sadece 42 tanesi kaldı. Bu sitelerden 25'i (% 59,5) özel diş kliniklerine, 9'u (% 21,4) sağlık ve diş hekimliği bilgilendirme sayfalarına, 8'i (% 19,1) meslek kuruluşlarının internet sitelerine aitti. Ortalama DISCERN puanı 42.4 olmakla birlikte, 24 ile 62 arasında değişiyordu. Ortalama FKRE 50.7 ± 14 idi, bu da 10. sınıftan 12. sınıfa kadar okuma seviyesine denk düşmektedir. Tüm web siteleri için ortalama FKGL puanı 8.5 ± 2.8 ve ortalama SMOG puanı 7.3 ± 2.0 idi.

Sonuç: Bu çalışmanın sonuçları, incelenen web sitelerindeki bilgilerin kalitesinin DISCERN'e göre adil olduğunu ve genel popülasyon için okunması ve yorumlanmasının çok zor olduğunu göstermiştir. Sağlık hizmetlerine dair bilgi sağlayanlar, travmatik diş yaralanmalarının tedavisi ile ilgili bilgilerin kalitesini ve okunabilirliğini iyileştirmeye odaklanmalıdır.

ANAHTAR KELİMELER

Diş Travması, Çevrimiçi Sağlık, Okunabilirlik, DISCERN, Google

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Introduction

Traumatic dental injuries is a highly prevalent public health issue all over the globe with a prevalence of 20% in the permanent dentition and 30% in primary dentition.¹ Dental trauma may cause social and economic problems and thus effect the quality of life of the individuals.² Management of dental traumatic injuries presents a challenge for the clinicians. Immediate management of traumatic injuries should start from the beginning of the time of injury. For this reason it is important to educate community regarding traumatic dental injuries.³

The internet has become one of the main sources of information for the patients who seek medical care.^{4,5} The increasing access from the community led the Internet become one of the most popular healthcare information source.⁶ Recently, due to the lockdowns and restrictions during COVID-19 pandemic, the written information on the internet became more important for the patients who suffered from traumatic dental injuries.⁷ This increased search for health information on the internet resulted in nearly millions of websites being developed.

It is essential that the written information on the internet regarding traumatic dental injuries should have high quality and easy to read by the general population.⁸ Previous studies showed that the information regarding medical treatments on websites were inappropriate and inaccurate.^{9,10} For this reason, it is important to evaluate the quality of the written information on internet. The DISCERN tool kit was developed in 1999 by Charnock et al.¹¹ which will enable patients and information providers to judge the quality of information on websites about medical and dental treatments. The ideology behind DISCERN toolkit is for helping patients and healthcare information providers to consider all aspects of a medical or dental treatment.¹² Although there are several studies found in literature using DISCERN toolkit investigating various dental and medical treatments on search engines, only one study investigated traumatic dental injuries which was carried out on Facebook.¹³ Therefore, it is important to assess the quality and readability of the written information on treatments of traumatic dental injuries on websites.

The aim of this study was to evaluate the quality and readability of the written information about treatments of traumatic dental injuries on the internet.

Materials And Methods

An internet search was carried out using Google search engine in Turkish and for Turkish based websites with the terms of " treatment of broken teeth" (711.000 results), "treatment of tooth trauma" (3.250.000 results), " treatment of anterior tooth fractures in children" (5.170.000 results), "fractured teeth treatments" (403.000 results) between the dates of 01/06/2020 and

fractures in children" (5.170.000 results), "fractured teeth treatments" (403.000 results) between the dates of 01/06/2020 and 30/06/2020. The first 30 websites obtained after searching for each keyword were evaluated since 90% of internet users do not look more than this number.¹⁴ The duplicate websites, links to research studies, advertisements, discussion groups, videos and images were excluded from the evaluation. The remaining websites (n=42) which met the criterias were evaluated by one pediatric dentist (A.A.A.) and were analyzed with the DISCERN toolkit. DISCERN tool kit composed of 3 sections and 16 questions which is scored from 1 to 5. Section 1 includes 8 questions that evaluating the reliability of the publications while section 2 composed of 7 questions evaluating the quality of the information. The last section is composed of a single question which evaluates the overall quality of the publications. According to the DISCERN toolkit, the average scores of the websites were divided into 5 groups (16-26 = very poor, 27-38 = poor, 39-50 = fair, 51-62 = good, 63-80 = excellent). The evaluator read all the information about treatments of dental traumatic injuries and rated each website according to the DISCERN toolkit. Obtained results were calculated as average score, percentages and ranges.

Readability Assessment Tools

The readability level of each website was determined by using three indices: Fresch- Kincaid Grade Level (FKGL), Flesch-Kincaid Reading Ease (FKRE) and Simple Measure of Gobbledygook reading grade level (SMOG) 15. FKGL is calculated with two aspects of the written information: average sentence length (ASL) and average number of syllables per word (ASW) in three steps. In the first step, the total words are divided by the total sentences and multiplied by 0.39. In the second step, total syllables are divided by the total words and multiplied by 11.8 and the scores from two steps are added together. In the last step, 15.59 is subtracted from the total of first two steps ($(0.39 \times ASL) + (11.8 \times ASW) - 15.59$). FKRE uses ASL and ASW to determine reading ease. The formula of FKRE is $206.835 - (1.015 \times ASL) - (84.6 \times ASW)$. The score index is ranged between 0 to 100 (Table 1).

Table 1.
Flesch-Kincaid Reading Ease scores and their equivalent grade levels

Flesch-Kincaid Reading Ease Score	School level	Notes
100.00-90.00	5 th grade	Very easy to read. Easily understood by an average 11-year-old student.
90.0-80.0	6 th grade	Easy to read. Conversational English for consumers.
80.0-70.0	7 th grade	Fairly easy to read.
70.0-60.0	8 th & 9 th grade	Plain English. Easily understood by 13- to 15-year-old students.
60.0-50.0	10 th to 12 th grade	Fairly difficult to read.
50.0-30.0	College	Difficult to read.
30.0-10.0	College graduate	Very difficult to read. Best understood by university graduates.
10.0-0.0	Professional	Extremely difficult to read. Best understood by university graduates.

SMOG is an index that estimates the years of education needed to understand documents by counting complex and words containing three or more syllables.

RESULTS

Quality Assessment

A total of 120 webpages were investigated but only 42 of them met the inclusion criterias. Among these websites, 25 (59.5%) of them were belonged to private dental clinics, 9 (21.4%) were informative pages about health and dentistry and 8 (19.1%) were belonged to professional organizations websites. The mean DISCERN score of the websites was fair (42.4) and ranged between 24-62 (Table 2).

Table 2.
The mean DISCERN scores according to the sections and websites

sw	Total (n=42)	Private Dental Clinics (n=25)	Informative Pages about Health and Dentistry (n=9)	Professional Organizations (n=8)
Average DISCERN Score	42.4	42.6	42.2	42
Section 1 Mean Score (Questions 1-8)	44823	18	44671	44612
Section 2 Mean Score (Questions 9-15)	44731	44639	44580	21
Section 3 Mean Score (Question 16)	44806	44806	44775	3
Range	24-62	24-62	32-51	36-61

The average total scores of private dental clinics (42.6), informative pages about health and dentistry (42.2) and professional organizations (42) were found similar. No website has reached an excellent DISCERN score (scores between 63-80) while one website was scored as very poor (scores between 16-26) (Table 3)

Table 3.
The frequency distribution of websites according to DISCERN scores

DISCERN Score (16-75)	Total (n=42)	Private Dental Clinics (n=25)	Informative Pages about Health and Dentistry (n=9)	Professional Organizations (n=8)
Very Poor (16-26)	1 (2.4 %)	1 (4 %)	0	0
Poor (27-38)	13 (31 %)	5 (20 %)	4 (45 %)	2 (25 %)
Fair (39-50)	20 (47.6 %)	15 (60 %)	3 (33 %)	4 (50 %)
Good (51-62)	8 (19 %)	4 (16 %)	2 (22 %)	2 (25 %)
Excellent (63-80)	0	0	0	0

The average DISCERN scores of each question was shown in **Table 4**.

Table 4.

The average DISCERN scores of each question.

Question	Average Score
	(0-5 points)
Q1- Are the aims clear?	3,1
Q2- Does it achieve its aims?	3
Q3- Is it relevant?	3,3
Q4- Is it clear what sources of information were used to compile the publication (other than the author or producer)?	1,6
Q5- Is it clear when the information used or reported in the publication was produced?	1,9
Q6- Is it balanced or unbiased?	2,7
Q7- Does it provide details of additional sources of support and information?	1,9
Q8- Does it refer to areas of uncertainty?	2,2
Section 1	19,9
Is the publication reliable?	
Q9- Does it describe how each treatment works?	2,8
Q10- Does it describe the benefits of each treatment?	3
Q11- Does it describe the risks of each treatment?	2,1
Q12- Does it describe what would happen if no treatment is used?	2,9
Q13- Does it describe how treatment choices affect the overall quality of life?	2,4
Q14- Is it clear that there may be more than one possible choice of treatment?	3,2
Q15- Does it provide support for shared decision-making?	2,8
Section 2	19,6
How good is the quality of information on treatment choices?	
Total Score (Section 1 + Section 2)	39,5
Section 3	2,9
Overall rating of the publication	

The scores of questions regarding aim, alternative treatments and benefits of the treatments were found to be higher than the remaining questions. However, the sources of information and the date of publications were not mentioned in the majority of the websites.

Readability Assessment

The average FKRE was 50.7 ± 14.8 and ranged between 24.9 - 67.3 which is equivalent to a reading level of 10th to 12nd grade and considered as difficult to read (Table 5)

Table 5.
Mean scores and standard deviations for each readability index

Readability Index	Flesch-Kincaid Reading Ease (FKRE)	Flesch-Kincaid Grade Level (FKGL)	Simple Measure of Gobbledygook (SMOG)	Average Grade Level
Total (n=42)	50.9 ± 16.2	8.3 ± 3.1	7.2 ± 2.2	10 th to 12 nd grade
Professional Organizations (n=8)	54.9 ± 14.5	7.7 ± 2.1	6.8 ± 1.4	10 th to 12 nd grade
Private Dental Clinics (n=25)	49.9 ± 14.8	8.5 ± 2.9	7.2 ± 1.9	College grade
Informative Pages about Health and Dentistry (n=9)	49.7 ± 16.2	9.5 ± 3.1	8.1 ± 2.6	College grade

The mean FKRE for private dental clinics was 49.9 ± 14.8 , 49.7 ± 16.2 for informative pages about health and dentistry which was equivalent to a reading level of college grade reading level. However, the mean FKRE score for professional organizations' websites was found to be 54.9 ± 14.5 which was equivalent to a reading level of 10th to 12nd grade. The mean FKGL for all the websites was 8.5 ± 2.8 . The average FKGL for private dental clinics was 8.5 ± 2.9 , for informative pages about health and dentistry was 9.5 ± 3.1 and for professional organizations' websites was 7.7 ± 2.1 . Our findings of the SMOG analysis showed an average score of 7.3 ± 2.0 for all the websites. The mean number of polysyllabic words in the websites of private dental clinics was 7.2 ± 1.9 , while 8.1 ± 2.6 for informative pages about health and dentistry and 6.8 ± 1.4 for professional organizations' websites.

Discussion

Traumatic dental injuries is a significant worldwide community problem because of its impact on social life, economics and quality of life. For this reason it is important for parents and individuals to access accurate and appropriate information about traumatic dental injuries. Recently internet has become the source of information for both healthcare provider and a patients.¹⁶

To date, this is the first study to evaluate both quality and the readability of information related to treatments of traumatic dental injuries on search engines. Four keywords were used to access different types of websites and the keywords were chosen presuming what might general population would employ when searching for treatments of traumatic dental injuries. The findings of this study showed that the quality of information on the investigated websites was fair according to the DISCERN toolkit and too difficult to read and interpret for the general population.

The written information on websites must be accurate and easy to read to achieve their goals especially during in crisis times like COVID-19 pandemic. Healthcare providers suggested that the information on websites for patients or caregivers should be at the 6th grade reading level to have the desired effect.^{17,18} Our analysis with FKRE, FKGL and SMOG showed that the readability of information regarding treatments of traumatic dental injuries on the internet was equivalent to a 10th to 12nd grade reading level which is equivalent to a 15 to 18 years of age. The information on websites of private dental clinics appeared to be more easy to read rather than the websites of professional organizations' and informative pages about health and dentistry. Our results were in accordance with the previous studies which investigated the readability of information with similar readability indices.^{14,19-21}

It is essential to evaluate the written information on websites objectively as the internet has become one of the main sources of information for the general public. For this reason, the DISCERN toolkit was used to evaluate the quality of information on websites as reported in the previous studies.^{13,22,23} According to the results of the DISCERN analysis of the present study, the information on websites regarding treatments of traumatic dental injuries was limited and deficient in terms of reliability and quality. Our findings were in accordance with the previous studies.^{24,25} Majority of the websites achieved their aim, revealed information about alternative treatments and the benefits of the treatments. However minority of them revealed their source of information and date of publication which was in common with the previous studies.^{19,26}

There are several limitations and constraints of this study that must be kept in mind when interpreting the findings. The search engines and internet are continuously updating and improving their data with new information, especially during this COVID-19 pandemic, thus the same search strategy may produce different results at different times. The country settings was used for Turkey in order to evaluate the quality on Turkish based websites which may produce different findings for different country settings all over the world.

Conclusions

The internet is a valuable source of information which can be accessed by the general population thus the quality and readability of the written information regarding treatments of traumatic dental injuries must be accurate and appropriate. According to the results of the present study, majority of the websites were not at a universal reading level and have low quality of information regarding traumatic dental injuries. Publishers must focus on improving the quality and readability of the information about traumatic dental injuries and should place more emphasis on posting information related to prevention and immediate management of traumatic dental injuries.

Compliance With Ethical Standards

Conflict of interest

All authors deny any conflicts of interest related to this study.

Funding

This work was not supported by any organization.

Ethical Approval

This article does not contain any studies with human participants or animals performed by any of the authors.

Informed Consent

For this type of study, formal consent is not required.

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