Role of Smart Phones in Dental Trauma

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I.   Introduction :

Dental trauma is, unfortunately, not uncommon and may be even more prevalent in high-risk populations such as children , special needed/handicapped individuals , sportsmen, and military personnel . Additional preventable risk factors for tooth injury include, among others, lip or tongue piercing with intraoral ornaments and other para functional habits. Various psychological, economic and physiological damages can be the result of a tooth injury. It should be understood and acknowledged that many cases of dental trauma could have been prevented. Better late than never, adverse progression and future complication of dental trauma can be prevented by appropriate and prompt management.[1]

Studies find that there is lack of knowledge regarding management of dental trauma among mothers with or without previous experience of dental trauma.[1]

Hence, healthcare providers, such as dentists, dental hygienists, physicians, and nurses, have a significant role in primary prevention of dental trauma.[2]

The best way to reach put masses and bring out an awareness of dental trauma is to communicate using audio visual methods. Screening of a film through media circles can be the ideal way. Audio-visual aids arouse the viewer's attention in a passive way without any effort on his part.[3]

TV, radio, and the Internet are the most important health information sources for American teens. Slowly these sources are being replaced by smart phones. The smartphones of today are powerful computers with large memory, good screen displays and the availability of apps. Using of smart phones to spread awareness would be most efficient and simplest way of communicating with today's generation.[4] Dentistry is being reshaped by the constant updating of technology and this includes the use of mobile phone apps.[5]

This article aims to provide an overview of the apps available for traumatic dental injuries on four of the main operating systems for smartphones. Of particular interest would be apps that are targeted towards patients in the emergency management of tooth injury as well as practicing clinicians in the subsequent management of dental trauma.

II.   Materials And Method:

Four smartphone devices were used to access their respective app stores on 28 February 2017. A Nokia Lumia 640 (Nokia Corporation, Nokia Group, Helsinki, Finland) was used to search with Windows Phone OS. An iPhone 7 with iOS software was used to search the Apple App Store. Blackberry was used to search Apps in its respective store .Finally, Google Nexus 5X with Android OS v7.1.2 was used to search Google Play. Around nine phrases that patients or clinicians might use to search for apps relating to dental trauma were chosen: broken tooth/teeth; chipped tooth/teeth; dental emergency; dental injury; dental trauma; fractured tooth/ teeth; knocked-out tooth/teeth; tooth/teeth injury; and tooth/teeth trauma. These phrases were then searched in smartphone's app search facility to produce a list of available apps. The search output contains a brief description of the app that has been provided by the developer. This summary was used to determine how appropriate the app was to dental trauma. Apps were listed based on the star rating and number if ratings and cost of using the app for the user. Where appropriate, apps were downloaded for further evaluation. Some apps featured a 'lite' and 'full' version; the former often being free to the user while the latter required the payment of a fee. In such cases, the two versions were counted as separate apps as accessible information would be different for both versions. Any non-English language apps were translated using Google Translate (Google Inc.). The apps were grouped for presentation into categories according to the type of app. Any non-health,

general dental and medical apps were subsequently excluded. Only apps with a core content relating to dental trauma were included and analysed.

III.   Results:

The number of apps retrieved using the nine phrases (broken tooth/teeth; chipped tooth/teeth; dental emergency; dental injury; dental trauma; fractured tooth/ teeth; knocked-out tooth/teeth; tooth/teeth injury; and tooth/teeth trauma) are shown in Table 1,2,3 and 4 .

A large proportion of apps were grouped as 'nonhealth', and these were often gaming or utility related. There was an abundance of entertainment apps that ranged from the user having to remove dental decay from animated mouths, extract teeth or whitening treatment. Medical apps are often related to education in areas such as anatomy, general surgery and orthopedics. Some medical apps focused on multiple-choice questions or flash cards to help users prepare for tests and examinations. Dental apps included those about dental anatomy, dental terminology as well as a tooth brushing timer. Dental practice apps were also included in the Dental category if they contained some information on traumatic dental injury. Apps in the preceding three categories were excluded, and those with a core content relating to traumatic dental injury were analysed further.

Duplicate apps from the phrase searches were deleted, and the resulting apps are shown in Table 5. There were nine apps for the Android and one app for Apple operating systems. The only Apple iOS app retrieved (Dental Trauma) was also found for the Android OS (Dental Trauma First Aid). No traumatic dental injury apps were found for the Windows Phone OS.

AcciDent was a multilingual app available in English and German for the Android OS and was the only app dedicated to traumatic dental injuries targeted solely towards dental professionals. On visiting the developers' website (14), it was discovered that the app was also available for the Apple iOS; however, the app had not been retrieved using any of the phrase searches in this study.

The Dental Trauma app (Apple iOS) and Dental Trauma First Aid app (Android OS) were both identical. The developer (15) has the endorsement of the International Association of Dental Traumatology (IADT), and the app is available in 18 languages. The app aims to increase knowledge among the general population on how to take care of traumatic dental injuries at the scene of an accident. The developers target their product particularly to parents, teachers and sport coaches, although any individual would find the information of value if faced with a dental trauma emergency.

The remaining seven apps (Chipped Tooth Solution, Dental Crown Repair, Fixing Cracked Tooth, Repairing the Front Tooth and Solution to Broken Tooth) were only available for the Android OS and appeared to come from the same source (KBES). These were all available for download without the need to pay a fee. All these apps shared a common theme, containing some information indicative of the app title along with dental news, photographs and videos. The information contained in the app provided a brief description of how a dental injury scenario would be managed by the dentist.

Android OS version was more informative and educative followed by Apple IOS with very minimal provided by with Windows and Blackberry.

Table 1. Search results for the nine phrases using the Apple IOS operating system

Category	Broken Tooth	Chipped Tooth	Dental Emergency	Dental Injury	Dental Trauma	Fractured Tooth	Knocked-Out Tooth	Tooth injury	Tooth Trauma
Trauma	0	0	0	1	1	0	0	1	1
Dental	0	0	16	1	0	0	0	0	0
Medical	0	0	4	0	3	0	0	0	1
Non health	4	0	12			0	0	1	4
TOTAL	4	0	32	2	4	0	0	2	6

Table 2. Search results for the nine phrases using the Nokia Lumia operating system

Category	Broken Tooth	Chipped Tooth	Dental Emergency	Dental Injury	Dental Trauma	Fractured Tooth	Knocked-Out Tooth	Tooth injury	Tooth Trauma
Trauma	0	0	0	0	0	0	0	0	0
Dental	00	0	0	0	0	0	0	0	0
Medical	0	0	0	0	0	0	0	0	0
Non health	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0		0	0	0	0	0

Table 3.Search results for the nine phrases using the Black berry operating system

Category	Broken Tooth	Chipped Tooth	Dental Emergency	Dental Injury	Dental Trauma	Fractured Tooth	Knocked-Out Tooth	Tooth injury	Tooth Trauma
Trauma	0	0	0	0	0	0	0	0	0
Dental	0	0	0	0	0	0	0	0	0
Medical	0	0	0	0	0	0	0	0	0
Non health	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0

Table 4. Search results for the nine phrases using the Google Nexus Android operating system

Category	Broken Tooth	Chipped Tooth	Dental Emergency	Dental Injury	Dental Trauma	Fractured Tooth	Knocked-Out Tooth	Tooth injury	Tooth Trauma
Trauma	9	6	2	4	5	6	2	3	4
Dental	43	44	75	26	18	23	2	31	17
Medical	31	36	91	106	77	21	1	57	70
Non health	83	144	62	105	32	60	31	119	55
TOTAL	166	230	230	241	132	110	36	210	146

Table 5. Apps relevant to dental trauma on Android OS

App	Operating system	Current version	Updated	Size	Offered by	Developer website	Cost	Score	Description	Target user
Accident	Android	2.2	17/11/14	6.26 MB	Zahnunfalzentrum (Universitatskliniken fur Zahnmedizn and Universitat Basel)	zahnunfalzentrum.ch	Rs.291.19	5	Information on diagnosis and treatment of dental trauma for those in general practice	Clinicians
Dental trauma first aid		1.94	7/1/2016	3.74 MB	Ulf Glendor (Linkoping University)	dentaltrauma.se	Rs.188.78	3.2	How to take care of dental trauma at the scene of an accident for the general population. IADT endorsed	Clinicians & Patients
Chipped tooth solution		1.01	16/7/2013	1.67 KBES		talal0x@gmail.com (only email provided)	0	unrated	Information on treatment of a chipped tooth	Patients
Dental crown Repair		1.01	16/7/2013	1.32 KBES		talal0x@gmail.com (only email provided)	0	unrated	Information on how a broken crown is repaired	Patients
Fixing cracked tooth		1.01	16/7/2013	1.83 KBES		talal0x@gmail.com (only email provided)	0	4.0	Information on treatment of a cracked tooth	Patients
Repairing front tooth		1.01	16/7/2013	1.47 KBES		talal0x@gmail.com (only email provided)	0	unrated	Information on treatment options for repairing a front tooth	Patients
Solution to broken tooth		1.01	16/7/2013	1.30 KBES		talal0x@gmail.com (only email provided)	0	unrated	Information on treatment of a broken tooth	Patients
Traumatic dental injuries		2.3.1	18/12/2014	6.38 MB	MedHand Mobile Libraries	android@medhand.net	Rs.2962.16	4.0	A manual guide to dental trauma demonstrating step by step treatment	Patients
Trauma dentoalveolar		2.0.0	30/6/2016	11.98 MB	Developer CR	Rodriguezjulia891@gmail.com	0	4.2	To study trauma dentoalveolar	Patients
Injured tooth		1.0	3/12/2016	407KB	IGNOBILIS TERRAIN LLP	brokentooth.ignobilis@gmail.com	Rs.400	5	To diagnose injuries precisely and plan evidence based treatment. Follow up alerts for dentist and patient	Clinicians & Patients

IV. Discussion :

All the apps of Windows phone OS were inappropriate when searched with the nine phrases. Apple iOS only produced only one app and Android OS produced nine apps related to traumatic dental injuries. This is a clear example of the difficulty users may encounter when trying to access appropriate apps. In fact, the app AcciDent was available for both Android OS and Apple iOS yet the phrase searches did not retrieve this app for the Apple Ios.

AcciDent appeared good value for money given the breadth and depth of information offered. This app was rated an average score of 5 of 5 with ten reviews. Although no formal endorsement by the IADT, the developers at the University of Basel have produced an app with concise information, together with illustrations on the full range of dental trauma scenarios.

The Dental Trauma app (Apple iOS) and Dental Trauma First Aid app (Android OS) would also be of value to patients and dentists. The developer at the University of Linkoping has the endorsement of the IADT which should reassure dentists that the advice offered is based on the most up-to-date scientific evidence. The current gold standard for the management of traumatic dental injuries has been well documented by the IADT, and these apps should be seen as a source of valid dental trauma information.[7,8,9]

Again, clinical photographs are missing and illustrations help to guide the user in the emergency management of the full range of dental trauma scenarios. The app has been translated into 16 languages to ensure that it has worldwide appeal, and although there were only 2 reviews, the average score was 5 of 5.

A number of apps, which were produced for practice marketing, were excluded; however, some of these did contain information on the management of dental trauma. As apps are often relatively small and specialized programs, the depth of information available on the practice apps was often limited. Patients may find accessing appropriate information less straightforward than if using specific dental trauma apps.

Despite these advances in technology, traditional methods for imparting advice to our patients should not be forgotten. Parents of recalled patients are found to be more knowledgeable about dental trauma management, and this could suggest that the dental visit can be an effective vehicle for education.[10] The importance of moving from 'treating' towards 'managing' risk factors and prevention also remains a high priority.[1]

V. Conclusion:

There are apps available for both patients and dentists in the emergency management of traumatic dental injuries.

The apps range in quality and on the whole lack in real-life photographs. Future apps should continue to provide good quality, evidence-based and validated material and perhaps employ methods such as moving animation and social media that younger people are using every day. Android OS version was more informative and educative followed by Apple IOS with very minimal provided by with Windows and Blackberry .

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