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### RESEARCH ARTICLE

#### A QUESTIONNAIRE STUDY ON APPLICATION OF A COMPREHENSIVE ORAL HYGIENE APP AMONG GENERAL POPULATION.

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#### Manuscript Info

#### Abstract

#### Manuscript History

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#### Introduction:-

The role of mobile applications has become central to our daily operations and activities. The dental office is no exception. The mobile applications have gained entry into everyday dental office and are playing an important role not only in administrative areas but also in the clinical aspects. For dental office administrators, the mobile apps are used for keeping appointments and track patients schedule and treatment log. The apps are being used extensively by the dentists for handy information on drugs and various surgical procedures. The apps are also being used by the patients for information on brushing techniques and as manuals for aftercare.

There are number of mobile apps already in the market<sup>1-3</sup>. The apps are designed to aid in the dental practice management, as clinical reference guides, for proper drug dosage, as reference tools, for information on recent updates on medical and dental health, to assist the dentist in coordinating with the lab for various indirect restorations, for viewing X-rays, virtual dentistry based apps to try different treatment procedures for a case, for information on Orthodontic, Periodontal and Oral surgical procedures.

The purpose of this study was to understand patient's awareness and obtain necessary information about an ideal patient friendly dental application by means of a descriptive Questionnaire. There are only few patient related apps<sup>1-3</sup> that focus on comprehensive dentalcare. This Questionnaire was an attempt to gather information on what in the patient's view is an ideal Dental treatment App.

#### Aims and Objectives:-

- To collect the necessary information about a comprehensive oral hygiene mobile application from the general population.

#### Objectives:-

- To conduct a detailed survey of the perception of general population on patient based oral hygiene application in mobile phones.
- To evaluate the necessity of such application to manage dental treatment.
- To evaluate the necessity of a comprehensive dental app versus other apps already available in the market.

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**Review Of Literature:-****1. <https://www.123dentist.com/top-10-dental-apps-for-smartphones/>**

- a) **Brush DJ**—Brush DJ helps you to brush your teeth for the full two minutes to a randomly selected song from your playlist.
- b) **Dental Expert**—Dental Expert is a patient's guide to understanding dentistry procedures, including some tips on how to care for your own smile.
- c) **Dental Phobia**—Dental Phobia provides users with information that you need to deal with dental fears and phobias.
- d) **Braces Help**—Braces Help is an informative app for patients wearing braces.
- e) **Teeth Whitener**—Teeth Whitener is a fun app that allows you to see how you would look with a brighter smile.
- f) **KidsDental**—KidsDental uses animation to help you teach your child about their dental health in an entertaining and exciting way.
- g) **Dictionary of Dental Terminology**—The Dictionary of Dental Terminology provides patients with a list of dental terms explained in a way that is simple and easy to understand.
- h) **My Smile**—My Smile allows you to compare your tooth's colour shade on a 15 shade palate.
- i) **Monster Mouth DDS**—Monster Mouth DDS is a fun app that allows you, a dentist for monsters, to journey to different situations where you have to solve monster's dental problems before their mouth slams shut

**2. <http://dentistrybusiness.com/best-apps-for-dentists#1467730946685-475777d5-95cd>****a) dCStory: Patient Education**

Patient education tools play a critical role in sending difficult to understand clinical information to patients in an easy-to-understand style. This app provides several options of treatment plans and educational counseling with the help of high-definition 3D images. Patients can see more than 200 complex dental procedures, X-rays and photos. This app also gives you the opportunity to write out or sketch extra data on the image itself with the help of a stylus. This data can be printed or mailed online to the patient for viewing and reading at home.

- b) **Dental Demo Suite GP (DDS GP)** is the most wide-ranging app for patient education. With this app, patients can see numerous dental problems and their treatments. Stock images are part of this app, but patient images can also be uploaded into an image library. With each image, particular points relating to a dental condition can be marked for discussion. This app is available on Blackberry, Android and iOS platforms.

**c) Mavro: Dental Spanish Guide**

The Dental Spanish Guide app is perfect for dentists who don't speak Spanish but need to communicate with patients who only speak that language. The app allows dentists to choose phrases pertinent to dental treatments and

relay those messages to their Spanish-speaking patient. Another feature of the app is a flash card feature that helps dentists practice important phrases between patients.

#### d) Orasphere

Would you like to explain a complex procedure to a patient in a way they can understand? Orasphere, an iPhone app, features an assortment of *videos* for patient education. The patient can view the procedure to better understand the treatment you are about to give, and you can reduce your liability by providing full pre-treatment information at the same time. While some dentists have complained that the app needs a greater variety of videos, most agree that the graphics of the existing videos are outstanding. The good news is there are more videos coming soon.

#### e) Dental RX

Also at your iTunes store, you can find a handy app called Dental RX. Use the app to send a complete prescription to your dental lab. The prescription can include all the different fields necessary for any lab work, including dentin color, midline and occlusal plane. You can also add photos to the RX for even more comprehensive instructions.



### 3. <https://bibbynews.wordpress.com/2010/03/05/updated-list-of-iphone-apps-for-dentistry/>

- 1) 1000 Dental Flashcards & Quiz (\$1.99) Learn more than 1000 terms and concepts for the Dental Assisting National Board (DANB) certification test to become a Certified Dental Assistant (CDA) or Certified Orthodontic Assistant (COA).
- 2) 3D Dental A-Z: (.99) detailed visual insights into Teeth, Anatomy, Instruments, Care, Implants & more
- 3) **3D Dentist – the Chairside Assistant** (free) help your patients understand the procedures you offer.
- 4) **3D Human Oral Cavity** (6.99) images and illustrations of the Human Oral Cavity
- 5) **Animated Tooth Quiz** (\$1.99) Test your knowledge of human dental anatomy. For testing and educational purposes for people well-informed about the human teeth. Game consists of 48 illustrated questions with the animated images of each separate tooth.
- 6) **AO Surgery Reference** (free) includes sections on maxillofacial surgery, midface, mandible, dental alveolar, and skullbase/cranial vault
- 7) **Brush DJ** (free) Plays 2 minutes of music taken at random from your devices music library and has a visual display showing where to brush
- 8) **Brush'em** (free) helps you and your children to time brushing your teeth
- 9) **Brush-n-Boogie** (free) app to help you brush all the right areas of your mouth for the right amount of time.
- 10) **Brush It Up** (.99) Brush your teeth in a increasing difficulty game.
- 11) **Brush with Jackson** With supervision children use Jackson as a timer to brush for the recommended 2-3 minutes, twice a day and have fun whilst doing it.

- 12) **Cranial Nerves** (\$4.99) Learn the 12 cranial nerves.
- 13) **Crown & Glory** (free ) the dentist game
- 14) **Darby Dental** (free) distributor of dental supplies
- 15) **DAT Dental Exam** (.99) Practice exam to help dental professionals to prepare for the Dental Admission Test by the American Dental Association.
- 16) **DAT Flashcards** (free) Flashcards for the Dental Admissions Test
- 17) **DeStory** (free) educational and motivational tool for counseling dental patients.
- 18) **DDS GP** (\$399.99) for dentists, hygienists, and other dental professionals to increase case acceptance through better patient understanding of their dental health.
- 19) **Den-Dic Dental dictionary**. This app is free, but to obtain full access to the dictionary it requires a paid Online-Dental-Dictionary subscription which can be purchased via your iTunes account.
- 20) **Endodontics** (free) Endodontic journal.
- 21) **Epocrates: Drug Reference**
- 22) **Evidence Based Dentistry: (free)** systematic reviews, clinical recommendations and information for patients from the American Dental Association's Center for Evidence Based Dentistry (note, search for site in safari and then save as a bookmark to your home screen)
- 23) **The Fake Dentist** (free)
- 24) **Flashcard Study System for the CDA exam** (39.99) test questions on the Certified Dental Assistant Examination.
- 25) **Flossy** (.99) Flossy is an assistant that helps get you in the habit of flossing regularly.
- 26) **Got Cavities** (free) although the app is purely for entertainment it does provide a reminder to get a dental checkup regularly. With instructions on how to take a snap shot of your mouth and teeth this app magically evaluates tooth decay. Within less than a minute it returns the verdict and lets you know if you have cavities or whether your teeth are cavity free. Try it out on your friends and see who has the best dental hygiene. Show it to your Dentist and let them know how this little app keeps dental health at the top go your mind.
- 27) **Happy Teeth** (free) HAPPY TEETH is a FREE app that will allow you to enjoy fun music, and amazing graphics while at the same time showing you what quadrants of teeth you should be brushing. An adjustable timer will allow you to set the desired length of time to brush for.
- 28) **HD Dentistry** (.99) dental encyclopedia
- 29) **HealthPoint Capital News** – for the Orthopedic and Dental Industry (free): Get the latest news and analysis of the dental industry's markets, major players, technologies and trends.
- 30) **Implant Treatment Guide Lite (free)** explain complicated implant treatment options to your patients.
- 31) **IMuco Gingival Recessions (\$64.99)** Based on scientific studies and on his own clinical experience, the author, Dr. Olivier Carcuac shares with you his knowledge on mucogingival surgery for the treatment of gingival recessions.
- 32) **Instant Teeth Whitener** (1.99) see what you would look like with whiter teeth.
- 33) **International Journal of Orthodontics** (free) a quarterly peer-reviewed clinical journal published by the International Association for Orthodontics (IAO). The IJO features original scientific and clinical articles on orthodontics, plus an editorial, practice tips and office management hints.
- 34) **IPanoramic** (\$1.99) panoramic radiographs provide a general overview for the patient's teeth, bone, and jaws. A panoramic radiograph is usually used to detect and assess impacted 3rd molars, pathology, or in patients who are partially or fully edentulous.
- 35) **iRomexis** (free) dental imaging tool which displays images acquired by Planmeca dental equipment
- 36) **iStudy Dental Anatomy** (\$2.99)
- 37) **Just Going to the Dentist** (.99) for children, based on Mercer Mayer's Little Critter stories
- 38) **Kid's Anatomy Human Teeth** (.99) learn Human Teeth and its functioning.
- 39) **Kids Brush: (1.99)** major encouragement to brush everyday and keep the sugar bugs away.
- 40) **KidsDental** (4.99) uses animation to entertain your child while teaching them how to care for their teeth.
- 41) **Kid's Dental Health** (1.99) This educational interactive book helps parents teach their children in a fun and entertaining way all about the essentials of oral hygiene.
- 42) **NBDE Part I Exam Prep** (9.99): Practice game contains 400 questions to help you prepare for the test. \$11.99
- 43) **NBDE Part II First Aid Q&A: first 50 test questions are free. Set of 600 \$44.99.**
- 44) **Netter's Advanced Head and Neck Flash Cards** (39.99) Using the same anatomical illustrations from Netter's Atlas of Human Anatomy, these flash cards feature concise text to review muscles, bones, vessels, viscera and the joints.
- 45) **Off We Go- Going to the Dentist** (3.99) Fun book to prepare children to go to the dentist

- 46) **Oral Care Buddy** (.99) tooth brush timer and patient education.
- 47) **OralEye** (free) Remote dental diagnosis platform.
- 48) **Orashpere:** (free) Dentist /patient education application describing the tooth anatomy and root canal procedures.
- 49) **Orthodontic Products** (free) provides the latest product news and technique tips, as well as articles by experts on topics including efficient treatment, staff management, and marketing methods.
- 50) **StarTeeth** (free) makes oral health fun for children
- 51) **Straighten Me** (free) educational app for orthodontics
- 52) **Straumann Patient Education** (free) This free app provides a convenient way to communicate the benefits of dental implants and describe treatment options and procedures, and allows dental professionals to customize the learning experience for each patient. It contains patient-friendly information, videos and animated graphics to help dental professionals inform their patients on dental implants solutions.
- 53) **Straumann Restorative Flipchart** (free) self-guiding tool the dental professional navigates through by indication type to determine the appropriate restorative component options that are available with the Straumann platform.
- 54) **Suturing Techniques** (\$3.99) Reviews suturing techniques in oral surgery
- 55) **Tooth First Aid** (.99): Quick help tool for dental emergencies.
- 56) **tOOothFun** (.99) Entertains children while they brush
- 57) **Toothie** (\$1.99) Guide to maintaining health teeth, gums and a beautiful smile
- 58) **Tooth Morphology** (4.99) for dental students
- 59) **Tooth Morphology Exam preparation** (1.99) useful study tool for dental undergraduate and postgraduate students in learning about and mastering the morphology of permanent dentition. It consists of clinical photographs with accompanying study notes and a chapter of short answer questions.
- 60) **ToothNotes** (.99) Tooth Notes records notes about your teeth. It helps you talk with your dentist by remembering the tooth or gum. In the 3D view, drag to rotate teeth.
- 61) **ToothScout HD** (free) assists the user in selecting the suitable teeth for beautiful and natural looking dentures which perfectly suit the patient's personal look.
- 62) **Tray Timers** (1.99) for anyone using clear aligners
- 63) **Tx Simulator** (free) Explains dental and orthodontic treatments
- 64) **Tx Simulator II** (free) uses 3D graphics to explain treatments to your patient.
- 65) **ViewBox Dental** (.99) turn your iPhone or iPad into an X-ray view box.
- 66) **Virtual Dentist** (\$19.99) professional dental simulation application that enables users to upload a photo and try out a variety of different dental procedures virtually on their own (or a patient's) photo.
- 67) **Virtual Teeth Cleaning** (.99) Take on the role of a Virtual Dentist – You are in control as you clean a patient's teeth. Scrape, Brush, Rinse and Floss your way to a healthy smile in this highly interactive educational game! Great for kids learning what to expect at a dentist visit, and adults who want to learn more about dental health.
- 68) **XyloTeeth** (.99) the ultimate musical instrument for dentists and their patients.
- 69) **Yuck Mouth** (free): game to help children brush properly
- 70) **ZenDental** (free): keep track of how long you brush your teeth, share your smile or ask us questions about your dental health.

## Materials and Methods:-

### Materials and Methods

A Total of 530 subjects, from the general population, above 18 years of age group were randomly selected for this study.

### Subject selection:-

1. Both genders were included as subjects.
2. Population above 18 years of age were included in this study

### Exclusion criteria:-

1. Population below 18 years of age
2. Population not using touch screen mobile phones.

### Methodology:-

A descriptive continuous questionnaire was prepared using the guidelines.

**Questionnaire Survey:-**

The survey consisted of 34 questions with objective type answering pattern.

Sl.No		Tick If <b>YES</b>	Tick if <b>No( Give Reasons):</b>
1.	Do You Use a Mobile Phone?		
2.	Do You Use Mobile Applications like Whats App and Facebook?		
3.	Do You Use Mobile Apps other than the mostly used apps (Whats App and Facebook)?		
4.	Do you think maintaining oral hygiene is important for our health?		
5.	Do you find the necessity of a Professional Self Help App?		
6.	Have you used any health based app before?		
7.	Do you find such health based apps useful in the present times?		
8.	Would You Use a Dental app before undertaking a Dental Treatment?		
9.	Are you aware of any treatment based mobile apps?		
10.	Have you used of a Professional Self Help App before?		
11.	What's your Current Age? 0-18 years old 18-35 years old 35-65 years old >65 years old		
12.	Do you want biological age to be included in the app? If yes , it should be classified as :		
	<ul style="list-style-type: none"> <li>• 0-18 years old</li> <li>• 18-35 years old</li> <li>• 35-65years old</li> <li>• &gt;65 years old</li> </ul>	Tick if YES	If No: Give Reasons:
	<ul style="list-style-type: none"> <li>• Children</li> <li>• Youth</li> <li>• Adult</li> <li>• Geriatric Patient</li> </ul>	Tick if YES	
13	Do you consider such an app helpful in dental treatment management?	Tick If <b>YES</b>	Tick if <b>No( Give Reasons):</b>
14	Have you used free Mobile Apps?		
15	Have You used paid Mobile Apps?		
16	Would you want the app be customized to your dental needs?		
17	Would you want the information of the treatment procedures be divided branch wise : For Ex: 1. Endodontics-Root Canal Treatments, Fillings 2. Prosthodontics-Replacement of Missing teeth So On.		
18	Would providing information of different branches and the relevant treatment procedures be helpful handy information?		
19	Do you want the FAQs of the treatment procedure be included before visiting the dentist?		
20	Would you like the app to have features demonstrating the		

	treatment videos for reference?		
21	Would you want a personal patient log be included in the app?		
22	Would you like your dental files and history to be recorded into this personal log to ease future communications with different dentists?		
23	Would you want the appointment reminder feature be included in the app?		
24	If yes, would you like the app notify you through an alarm?		
25	Would you like the drug information be included in the app?		
26	Would you like a video call feature to communicate with your dentist to be present in the app?		
27	Would you like a video call feature to communicate with any dental professional around in the region?		
28	<p>If yes, which would you prefer?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Facetime</li> <li><input type="checkbox"/> Skype</li> <li><input type="checkbox"/> IMO</li> <li><input type="checkbox"/> Whatsapp</li> <li><input type="checkbox"/> Google Hangouts</li> <li><input type="checkbox"/> Others</li> </ul> <p>.....</p>		
29	Would you like a feature in which your dentist could update this personal log after every treatment/visit?		
30	Would you like a feature in which general symptoms be listed?		
31	Would you like the app to include the maintenance practices after treatment?		
32	Would you want the app to include treatment specific maintenance practices?		
33	<p>Would you like the general notifications of dental checkup/recommendations be included in the app?</p> <p>(Ex: It is recommended to change the tooth brush once every four months, and similar such recommendations)</p>		
34	<p>Following are the recommendations of the app design: (Tick which appeals to you the most)</p> <p><b>Model A</b> Customized Dental app suited to your phone (IOS/Android)</p> <p><b>Model B</b> Dental App with detailed data of dental treatment information, drug information and personal log.</p> <p><b>Model C</b> Customized Dental app with personal log and research based recommendations for maintaining your oral hygiene.</p> <p><b>Model D</b> General app with links to the information.</p> <p><b>Model E</b> An interactive app (Patient- Dentist, Family and peers with features like video calling and message reminders.</p>		

[illegible]

The subjects included both the genders above 18 years irrespective of their educational background and ethnicity. The subjects recruited were general public.

The data was subjected to statistical analysis.

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		N	%
Q18	No	36	6.8%
	Yes	490	93.2%
Q19	No	44	8.3%
	Yes	484	91.7%
Q20	No	67	12.7%
	Yes	462	87.3%
Q21	No	61	11.6%
	Yes	467	88.4%
Q22	No	45	8.5%
	Yes	482	91.5%
Q23	No	29	5.5%
	Yes	498	94.5%
Q24	No	85	16.2%
	Yes	441	83.8%
Q25	No	60	11.3%
	Yes	470	88.7%
Q26	No	161	30.4%
	Yes	369	69.6%
Q27	No	157	29.6%
	Yes	374	70.4%



Table No. 3:-

		N	%
Q29	No	35	6.7%
	Yes	491	93.3%
Q30	No	31	5.9%
	Yes	495	94.1%
Q31	No	19	3.6%
	Yes	507	96.4%
Q32	No	32	6.1%
	Yes	494	93.9%
Q33	No	51	9.7%
	Yes	474	90.3%
Q34	Missing	16	3.0%
	A	124	23.3%
	AB	4	.8%
	ABCE	1	.2%
	ABE	2	.4%
	AC	2	.4%
	AD	1	.2%
	ADE	2	.4%
	AE	11	2.1%
	ALL	1	.2%
	B	152	28.6%
	BC	4	.8%
	BCE	1	.2%
	BD	2	.4%
	BE	4	.8%
	C	128	24.1%
	CD	1	.2%
	CE	5	.9%
	D	39	7.3%
	DE	2	.4%
	E	30	5.6%

Q34	N	%
A	124	24.03
B	152	29.46
C	128	24.81
D	39	7.56
E	30	5.81
Multiple preferences	43	8.33

**Results:-**

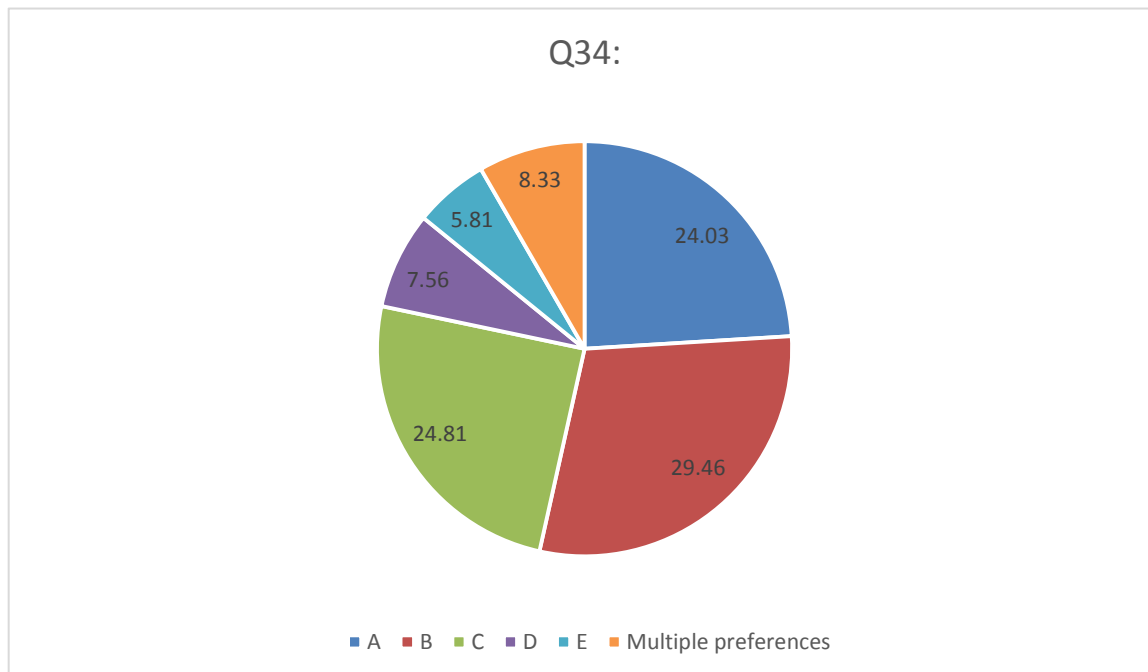
The results obtained show that the majority of the subjects chose Option B i.e. Dental app with detailed data of dental treatment information, drug information and personal log. Following this was preference for Option C i.e. customized dental app with personal log and research based recommendations for maintaining oral hygiene. Option A was also the preference for 24.03% of the subjects recruited which is based on customizing the dental app the suits the phone being used. There was no drastic difference in the preference percentages with 29.46% choosing Option B, 24.81% choosing Option C and 24.03% choosing Option A, respectively. 8.33% chose multiple entries for Question no. 34.

### Discussion:-

There has been an increase in the awareness levels of mobile apps used for dental clinical practice. There are various mobile applications available to the general public for specific treatment procedures in dental management. But there are only few mobile applications<sup>1-4</sup> available that do everything that the patient needs for his dental treatment management. This questionnaire was hence chosen as a descriptive survey to know the awareness levels on various dental apps and also to obtain necessary information required to design a comprehensive patient based app for dental treatment management.

Age group of 18 years and above was chosen for convenience sake as the majority of mobile phone users fall in this age group. Both genders were chosen for this study to eliminate gender bias. Population that does not use touch screen mobile phones were excluded from this study. Population was chosen irrespective of their educational background to gain a wider understanding in this area from people who had diverse educational backgrounds.

The descriptive survey was designed based on the standard guidelines of continuous type survey design with 34 questions with objective type answers. The comment section included reasons for choosing “No” as the answer. Question No. 34 was designed with a futuristic app design in mind. The results obtained show that the majority of the subjects chose Option B i.e. Dental app with detailed data of dental treatment information, drug information and



personal log. Following this was preference for Option C i.e. customized dental app with personal log and research based recommendations for maintaining oral hygiene. Option A was also the preference for 24.03% of the subjects recruited which is based on customizing the dental app the suits the phone being used. There was no drastic difference in the preference percentages with 29.46% choosing Option B, 24.81% choosing Option C and 24.03% choosing Option A, respectively.

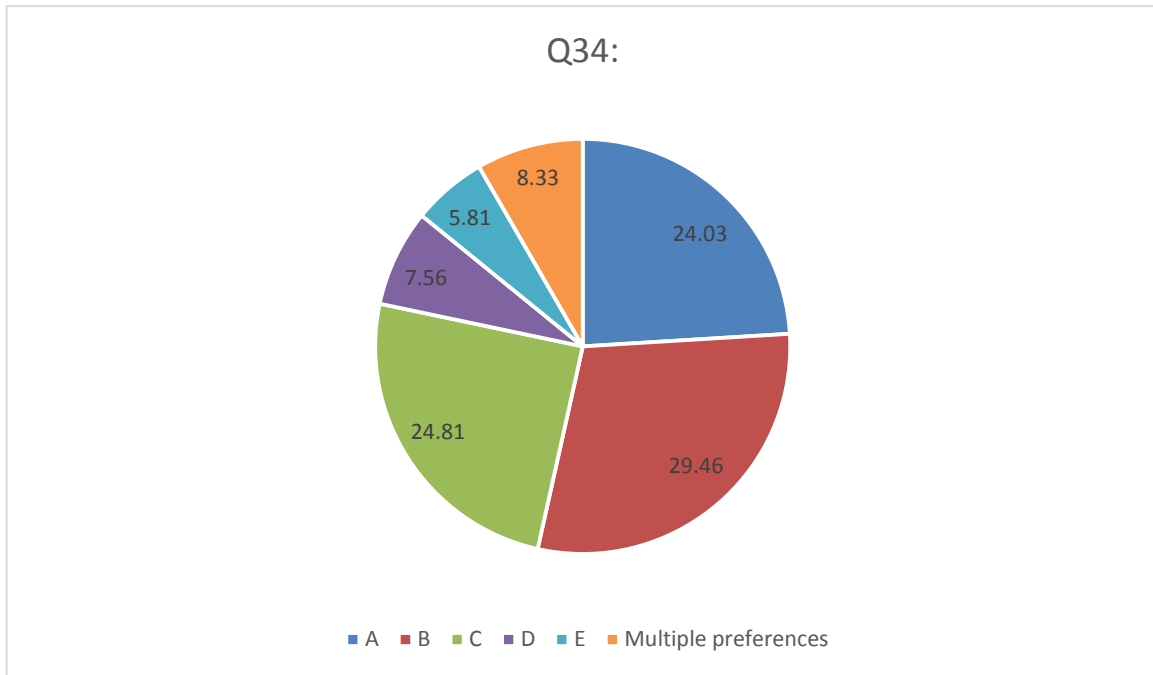
8.33% chose multiple entries for Question no. 34.

Hence there is growing need for an ideal patient based dental app for managing dental treatment. Since the preference for the ideal design model was same for Option A, B and C, it can be concluded that there is growing need for an ideal app though the ideal app design couldn't be ascertained.

The limitations of this study include smaller sample size. Other limitations are to perform this survey among different ethnicities to understand and confirm the ideal app design suited for all populations.

**Limitations:-**

1. Additional research using the same methodology is needed, but with a larger sample size.
2. This study can be performed in demographic population with variable ethnicity, and educational background.

**Conclusion:-**

In the light of the results of this investigation the following conclusions can be derived:

1. There is increase in the awareness levels of mobile applications in the field of Dentistry.
2. There is increased need for a comprehensive oral hygiene app exclusively designed for patients.
3. Patients preferred a mobile app that provided a detailed data of dental treatment information, drug information and the one that has a personal log compared to an app design that's customized to patient's needs with patient log and recommendations for maintaining oral hygiene.

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