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A MOBILE APP AS A TOOL FOR PROMOTION OF GOOD ORAL HYGIENE PRACTISES AMONG YOUNG ADULTS IN DAVANAGERE CITY, KARNATAKA

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ABSTRACT

The study aimed at assessing the use of Brush DJ app, thus compare the brushing efficiency with mobile app assisted brushing and regular oral hygiene practises. It uses timers and reminders to persuade users to brush their teeth regularly. The study subjects were aged 18-25 (*N*=120) from Davanagere city. The Simplified Oral Hygiene Index (OHI-S) by John C Greene and Jack R Vermillion were examined at baseline. Two investigators carried out examinations. They were calibrated by having each one of them practicing OHI-S on 20 participants and comparing their scores using interclass correlation coefficient. 60 participants were in the control group which consisted of verbal oral hygiene instructions and another 60 participants were enrolled in the intervention group and were taught to use the Brush DJ app. Follow up examination was done 20 days later. Statistics were performed using SPSS (version 21.0). Independent sample *t* test was used for comparison between the two groups and paired *t* test for comparison within the groups. It was found that at baseline there was no statistically significant difference between the two groups (p=0.2) and after 20 days there was found to be a statistically significant difference between the two groups (p= 0.04)

KEYWORDS: Brush DJ, Mobile assisted brushing, OHI-S, Mobile app, Health promotion.

INTRODUCTION

Young adults of today have grown up using mobile phones, which have become an integral part of their life and has reshaped their social life and behaviour. As of 2018, more than half of India's population is under the age of 25 years.[1]

The number of smartphone users in India was projected to cross 760 million by 2021. The number of smartphone users worldwide estimated to surpass to 3.8 billion users by 2021.[2]

Dental disease is considered the 4th most expensive disease to treat worldwide.[3] The current concept of satisfactory oral health goes beyond possessing healthy teeth, oral health is now known to be integral to general health and essential for well-being (World Health Organization, 2003). Oral hygiene is the cornerstone of good oral health especially in patients with challenges to practice normal oral hygiene.[4] Various studies have tried to find the most appropriate methods for oral hygiene instructions and maintain patient's compliance during treatment.[5] A Good education program prior to treatment can improve the compliance of patients.[6] The Brush DJ app was found to be the only dental app in the NHS Digital Apps Library that has been downloaded more than a third of a million times in 197 countries and features a timer that plays two minutes of music from the user's device or streaming service to make brushing more enjoyable and also contains evidence-based oral health information.[7–9] Despite the skyrocketing numbers of mobile health applications ('apps'), there is a lacunae of research into consumer engagement with electronic self-monitoring.[10]

The presence of these devices with the owners throughout the day, provide opportunities for the users to adopt behavioural programmes into important real-life contexts. Thus involving people in core decisions about their health and the barriers they encounter in behavioural change.[11] There has been a recent surge in research related to the use of mobile technologies for

health.[12] The high use of smart phones particularly by youngsters could ensure comprehensive access to adolescents. Smartphones may thus be a suitable approach for providing oral-health care information, changing oral-health behaviour and improving oral hygiene.[13] Promotion of health in the settings where people live, work, learn and play is clearly the most creative and cost-effective way of improving oral health and, in turn, the quality of life.[14]

Reminder based interventions make use of the behavioural learning theory. According to behavioural learning theory, behaviour depends on stimuli or cues, either internal (thoughts) external (environmental cues), suggesting that non-adherent behaviour can be modified after sufficient repetition of external stimuli or cues such as reminders.[15]

The intervention considered in the present study is also based on reminders. This app prompts users to brush for a 2 minute duration while listening to music, either from a playlist, or one chosen at random, from the music stored in device or a streaming service. Reminders can be set which prompts users to brush twice a day. The app also provides links to demonstrations on YouTube which aids the users to brush, floss and use other interdental aids in an effective manner.

Therefore, considering the undeniable role of reminders and apps in behavioural interventions, use of smartphone apps for this purpose is clear.[16] We hypothesized that OHI-S would be reduced more in participants who used the app with usual care than in control. The present study is aimed at comparing the brushing efficiency with regular oral hygiene practises and mobile assisted brushing.

MATERIALS AND METHODS

Data collection

A study was conducted on 60 students in two different colleges in Davanagere city (*N*=120), Karnataka in the period between October 2019 to November 2019.

Inclusion Criteria

Patients considered for the study included college going students of 18-25 age group, without any mental or physical disability or craniofacial disorders, periodontal disease or dental caries at study onset. We considered only those patients with Android version ≥ 4.0.3 or IOS version ≥ 9 operating systems.

Exclusion criteria

Those patients undergoing orthodontic treatment, on medications predisposing to plaque accumulation such as antibiotics and antibacterial rinses were not considered. Individuals with dentine dysplasia or enamel dysplasia, individuals on orthodontic treatment and patients with crowding were not considered for the study.

Sample size estimation

The sample size was calculated to be 60 in each group according to previous studies,[4][17] assuming a power of 0.9, confidence interval of 95%, standard deviation (SD) of 0.5, and with the aim of finding a 0.3 difference in the groups' means.

OHI-S index

The Simplified Oral Hygiene Index (OHI-S) was developed in 1964 by John C. Greene and Jack R. Vermillion. Instruments used included a Mouth mirror and No. 23 explorer (Shepherd's Hook). The OHI-S has two components, the Simplified Debris Index (Dl-S) and the Simplified Calculus Index (Cl-S). Once the Dl-S and Cl-S are calculated separately, then they are added together to get the OHI-S score.[18,19]

Examination and Reliability testing

Two investigators carried out the examinations. They were calibrated by having each one of them practicing OHI-S on 20 participants and comparing their scores using interclass correlation coefficient.

Baseline OHI-S score was measured at the beginning of the study. One group was given general oral hygiene instructions while the other group was asked to use the Brush DJ app. OHI-S was measured in each group again after 20 days. The control group received oral hygiene instruction by the conventional method, including explanation by a dentist, and by utilizing instructions on oral hygiene. The intervention group were trained to use the smartphone app, Brush DJ. The app included timer as well as daily reminders, in order to help patients to improve their oral hygiene status.

Statistical Analysis

The data was tabulated systematically using Microsoft excel 2016 and analysed using SPSS (Statistical Package for Social Sciences) version 21.0. Independent sample *t* test was used for comparison between the two groups and paired t test for comparison within the groups.

RESULTS

Independent sample t test was used for comparison between the two groups and paired t test for comparison within the groups. 60 samples taken in each group namely the app group and the oral hygiene practises group. It was found that at baseline there was no statistically significant difference between the two groups (p=0.2) and after 20 days there was found to be a statistically significant difference between the two groups (p= 0.04).

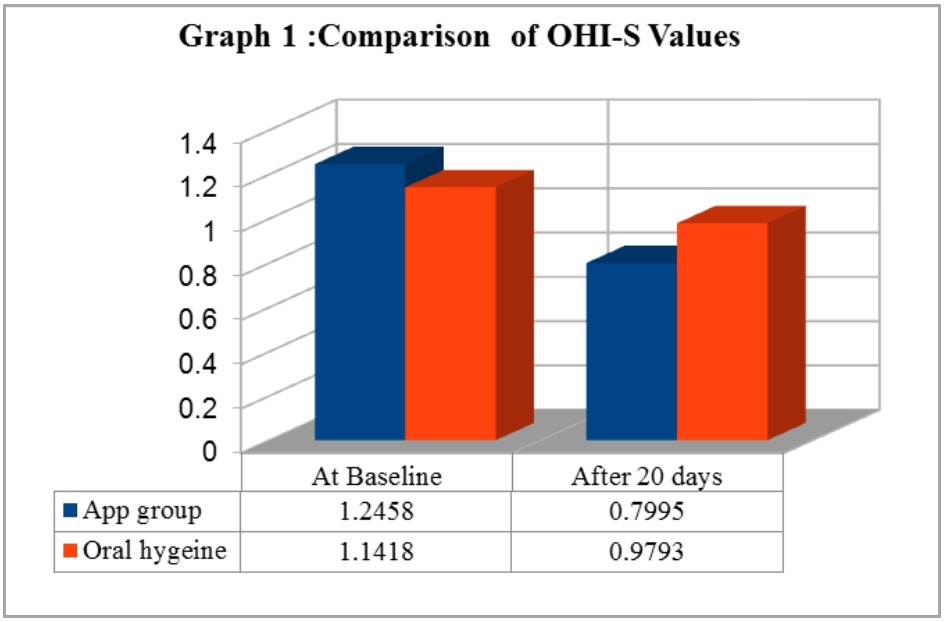

Table 1: OHI-S-Measurements between the groups.

	App group	Oral hygiene	t- value	p- value
At Baseline	1.24±0.49	1.14±0.39	1.29	0.2
After 20 days	0.80±0.45	0.98±0.48	-2.12	0.04
t- value	6.84	2.916		
p- value	0.001	0.001		

DISCUSSION

The need for good oral hygiene described as, the adequate removal of food residues, "debris," and "materia alba," has been advocated time and time again.[20] The provision of a complete patient education with emphasis on the importance of the given recommendations and ensuring compliance maybe often strenuous for the dental team. If young people are at first motivated, then given comprehensive home-care instruction, their chance of maintaining good oral health throughout life is excellent. Since we see patients regularly over an extended period, we are in a position to initiate and follow up this important learning process. Being in a position of respected authority gives the clinician a great opportunity to stimulate patient and parent interest.[21] The effectiveness of a smartphone app as an oral health promotive tool for improvement of oral hygiene status was investigated in comparison with verbal oral hygiene instructions.

We selected the Brush DJ app to motivate oral hygiene routine, and help patients manage their tooth brushing frequency and duration as it was found to be one of the most popular apps on both IOS and Android platforms. As per our literature search we believe this is the only study of its kind in the performed on the Indian population. The study showed a significant improvement in OHI-S in the population concerned as compared to conventional methods.Many studies reported findings quite similar to ours.

Eppiright et al in 2014 conducted a study to determine if text message reminders regarding oral hygiene compliance have an influence on the level of compliance within an orthodontic population. They found a text message reminder system to be effective in improving oral hygiene compliance in orthodontic patients.[17]

A mobile app had been designed by Alkadhi et al consisting of videos of oral hygiene instructions and text messages encouraging patients to practise oral hygiene tasks. Controls and patients allocated to the app all received traditional oral health promotion in an orthodontic clinic. The study, in adolescents in Saudi Arabia, showed that the app had reduced the dental plaque and gingival indices more effectively ($p < .05$) after 4 weeks of follow-up than verbal oral hygiene instructions had.[6]

A study was conducted by Janneke F. M. Scheerman et al to evaluate the effectiveness of the WhiteTeeth mobile app, a theory-based mobile health (mHealth) program for promoting oral hygiene in adolescent orthodontic patients. The study brought to light that adolescents with fixed orthodontic appliances can be helped to improve their oral hygiene when usual care is combined with a mobile app that provides oral health education and automatic coaching.[11]

When considering the limitations of the study, a potential bias that could not be eliminated was, the blinding of patients as the intervention was oral hygiene instructions and thus cannot be blinded from patients. The authors

admit the application of this tool may be associated with some amount of cynism as it is unchartered territory. A constant feedback maybe necessary while using the same in a clinical setting in order to assess the effectiveness as well as appropriateness for a particular population. If more such studies among different age groups and populations are undertaken it will go a long way, in ensuring the adoption of e-health/ m-health tools.

The present study is unique in that it was done in non-orthodontic patients while the previous studies were largely done on patients undergoing orthodontic correction for potential use as an oral health promotive tool. In addition to the conventional practice an addition of various multimedia tools to the arsenal of a dentist may help him stay in tune with the times. Such application by virtue of their inbuilt reminders as well as additional feature such as music may go a long way in enhancing patient compliance.

CONCLUSION

We conclude that the intervention group which used the Brush DJ app assisted oral hygiene showed a statistically significant improvement in OHI-S as compared to the regular oral hygiene practises and thus must be considered as an adjunct in everyday dental hygiene practise. The app usage frequency was found to be positively correlated with the brushing duration and frequency. We have come to understand that smartphone apps, when used as motivators and reminders, can improve patient's oral hygiene compliance, especially among adolescents. Thus such preventive interventions may play a great role in reducing long term costs.

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