Bulletin of Environment, Pharmacology and Life Sciences Bull. Env. Pharmacol. Life Sci., Spl Issue [2] 2022 : 326-334 ©2022 Academy for Environment and Life Sciences, India Online ISSN 2277-1808 Journal's URL:http://www.bepls.com CODEN: BEPLAD ORIGINAL ARTICLE



Effectiveness of Text Messaging in Improving Oral Hygiene Status and Utilization of Dental Services in College Students

Aanchal Mishra¹, Abhinav Bhargava², Shourya Tandon³ and Sachin Chand⁴

^{1,2,3,4}Department of Public Health Dentistry, SGT Dental College, Hospital and Research InstituteSGT University, Gurugram, Haryana

*Email:abhinav.bhargava@sgtuniversity.org

ABSTRACT

There are many studies on effectiveness of SMS on improvement of oral hygiene status orthodontic group. However, studies are scarce on effectiveness of SMS on oral hygiene and dental utilization including 5 groups of oral diseases. To determine effectiveness of text messaging in improvement of oral hygiene status and utilization of dental services in college students. In our longitudinal study we had covered 4 different most common oral problems and 1 control / healthy group. Oral diseases covered in rest 4 groups are – Dental caries, Gingivitis, Dental fluorosis and orthodontic group. 100 patients were selected according to the inclusion criteria. For all the groups oral hygiene compliance was measured using dental indices and were evaluated at 0 (S0), 30 (S1), 60 (S2) and 90 (S3) days. Statistical analysis was done using SPSS V.20.0 and pre - post scores were examined using the T test. A P value <0.005 was considered for statistical significance. In our study at baseline (S0), no noticeable variance in text message and control groups was noted while using any of the measuring indices. Also, both groups were not substantially dissimilar for any of the indices used for measurement at S1 (30 days). Clinically significant outcomes were observed at the time points S2 (60 days) and S3 (90 days). Text message alert mechanism is effective for cultivating dental utilization and improving status related to oral hygiene among patients.

Key words : Text message , Dental caries, Dental fluorosis, Gingivitis, Orthodontic patients

Received 28.07.2022

Revised 17.08.2022

Accepted 26.10.2022

INTRODUCTION

Dental caries continues to be the most significant oral health problem in the developing world, with an occurrence of 50-60 percent in India. In developing countries, it is a big oral health issue affecting 60-90 percent of school children[1]Traditional dental treatment is a major financial burden for various affluent nations where five to ten percent of spending on oral health is related to public health care. Public oral health services are not very common in economically weaker countries. Successful preventive and health associated education interventions will help reduce the high cost of dental care[2]Education encompassing health is an important part of health related promotion and health awareness and its determinants are critical for health maintenance, and ignorance about the same can be disempowering. Providing individuals and policy-makers with health-related knowledge is widely recognised as an integral part of health promotion[3]. The boom in computer science and information technology has changed people 's lifestyle quotient. Also, with new advances the crucial factor of communication with the patient has been made easy [4].

Short Messaging Service (SMS), a swiftly expanding technological advancement in countries irrespective of development status, has the ability to spread to a large number of people at relatively lower costs[5-6] Various researches have showcased that the usage of SMS appointment reminders was worthwhile in decreasing outpatient non attendance and more profitable than other telephonic reminder approaches[7-9]. Multiple researches have showcased that the usage of SMS appointment reminders has been successful in decreasing outpatient non-attendance and has better cost-effectiveness than other telephone notification methods. ¹⁰ SMS texting is the highest in young people who tend to have the largest rates of non-attendance when it comes to medical appointments[10-11].Web pages and other methods for collecting information have proven to be an integral component of our everyday lives, as they impart comprehensive knowledge on all facets of our society. This is reflected in oral health education where several different instruments have availability[12].

In a country such as India, with limited resources and manpower, community-based approaches and interventions targeting children are feasible and cost-effective ways to prevent growing trends in oral diseases. The new trend is being to explore the possibilities in the use of technology to disseminate preventive knowledge to the Population. In the light of the shortage of resources and from the point of view of health related to public domain, it is imperious to know which form of education in dental health is more effective [13]. The feasibility of using SMS messages for oral health education was stated in earlier studies [14-15].

In medical and dental sciences, active prompts have been seen to increase attendance related to appointments, adherence to medication timetables, and positive behaviour changes[16-20]. Strong reminders have been identified in medicine and dentistry to increase appointment compliance, devotion to prescription schedules and positive improvements related to behaviour. The aim of research was to evaluate the efficacy of text messaging related to improving awareness about oral hygiene in classified students based on the status of oral illness. They got bi-weekly text message updates reminding them in compliance with oral hygiene.

MATERIAL AND METHODS

Study Population

Our study was conducted in our dental college, Gurugram, after receiving the ethical clearance from the institutional review board. 100 students were selected using purposive sampling keeping in mind inclusion criteria.Our study was conducted among dental college students of Gurugram, Haryana was selected as the study area[21].

Inclusion Criteria & Exclusion criteria-

Students both male and female who gave voluntary consent were included. Students undergoing orthodontic treatment were included in group-5 and others who were having specific oral diseases were included in respective groups of our study .Students who were not willing to participate were excluded from our study.

Methodology-

Participants were drawn from age groups of 18-26 years who had unique oral diseases of both genders. Patients of all study groups underwent training on home based oral hygiene care with proper brushing and usage of mouth rinse and floss.5 groups taken and dental indices used to record baseline data for the study groups were recorded as follows,



PROCEDURE

Each group had 20 students . Subjects added in all the groups were instructed about home care oral hygiene with proper brushing and usage of mouth rinse and floss.

Baseline data was recorded using dental indices as mentioned above. After recording the data oral hygiene instructions were given and text messages were sent .After that pre and post message data for all study groups were recorded.

All the patients were selected as per the inclusion criteria were receiving text messages (EXCEPT THE CONTROL/HEALTHY GROUP).

Verbal consent was taken from all the participants. Patients were assigned to the text message group who received text message reminder twice every week .

After the interval of 0 (S0), 30 (S1), 60 (S2) and 90 (S3) days period all 5 groups were re-evaluated .

Text message sent on WhatsApp messenger was;

- HEY! IT'S IMPORTANT TO KEEP YOUR TEETH CLEAN TO KEEP IT HEALTHY!
- BRUSH TWICE A DAY, RINSE YOUR MOUTH AFTER EVERY MEAL & FLOSS WHENEVER NEEDED!
- DISCOLORATION OR CAVITATION IN TEETH MEANS IT'S DENTAL CARIES AND UNEED TO VISIT YOUR DENTIST 4 RESTORATION!

- IF UR TEETH ARE DIRTY OR YOU HAVE BLEEDING OR SWELLING IN GUMS, THEN VISIT YOUR DENTIST FOR TREATMENT!
- YELLOW-BROWN DISCOLORATION OR PITTING ON UR TEETH IS FLUOROSIS WHICH CAN BE TREATED BY UR DENTIST!
- PEOPLE GETTING ORTHODONTIC TREARTMENT MUST TAKE EXTRA CARE OF THEIR ORAL HYGIENE AND MUST USE INTERPROXIMAL BRUSH!

Armamentarium-

This study was performed using Mouth mirror, probe, tweezers, cotton ,explorer ,WHO dentition status, Plaque index , Gingival index , Dean's fluorosis index and OHI-S index proformas .

Statistical Analysis

All collected data underwent analysis related to statistics through the social sciences statistical package (SPSS version 20.0) programme including accurate representation with tables and Figures. Paired T test was applied to compare groups with each other, P<0.005 was considered for statistical significance.

RESULTS

In our research a total of 100 students were taken in our study of the age group (18-26 years). Out of which 19 were male and 81 were females. (Table 1). In our study we observed that according to the age of the students involved in our study in which 18-20 years (1^{st} and 2^{nd} years) were found to be in majority having oral problems. (Table 2).We observed clinical parameters of control group (Group 1) in the interval of 0 (S0), 30 (S1), 60 (S2), 90 (S3) days. On comparison of the mean values from 0 days (S0) to 90 days (S3) of Gingival Index, Plaque Index, Debris Index, Calculus Index and Oral Hygiene Index - Simplified values did not show significant improvement. (Figure 1)

Table 1: Distribution of the study population on the basis of gender and age

Age (years)	Male	Female	Total
18-26	19	81	100

Age (years)	Control	Dental caries	Gingivitis	Dental fluorosis	Orthodontic
18-20	11	12	13	16	11
(1 st & 2 nd years)					
21-23	7	8	7	4	8
(3 rd & 4 th years)					
24-26	2	-	-	-	1
(Internship)					

Table 2: Distribution of study population groups based on age

We observed clinical parameters of the dental caries group (Group 2) . It shows that the mean DMFT value and D component decreased, increasing the F component from S0 (0 Days) to S3 (90 days) was decreased . In comparison, mean values of DMFT 0 (0 days) to DMFT 2 (60 days) and DMFT 0 (0 days) to DMFT 3 (90 days) were found to be clinically significant .In Group 2 we observed students having dental caries. In this group we observed clinical parameters of the dental caries group . Mean DMFT value decreased from 0 to 90 days interval (Figure 2). We observed clinical parameters of Gingivitis group (Group 3) decreasing when compared from 0 (S0) to 90 (S3) days . On comparison mean values of Gingival index (GI-S0 to GI-S2 and GI- S0 to GI-S3) , plaque index (PI-S0 to PI-S2 and PI- S0 to PI-S3) , Debris index (DI-S0 to DI-S2 and DI- S0 to DI-S3) , Calculus index (CI-S0 to CI-S2 and CI- S0 to CI-S3) and oral hygiene index- simplified (OHI-S0 to OHI-S2 and OHI- S0 to OHI-S3) were shown to be clinically significant. (Figure 3)

We observed clinical parameters of the dental fluorosis group (Group 4). No Significant changes observed in Dental Fluorosis From S0 (0 days) to S3 (90 days). (Figure 4).We observed clinical parameters of orthodontic group mean values decreased from S0 (0 days) to S3 (90 days). In comparison, mean values of Gingival index , plaque index, Debris index , Calculus index and oral hygiene index- simplified all were shown to be clinically significant from S0 (0 days) to S3 (90 days). (Figure 5)



Figure 1: : Distribution of control/healthy group patients'





D- decayed M – missing F- Filled T- Teeth



PI- Plaque index GI-Gingival index OHI-S – Oral hygiene index simplified DI-Debris index CI- Calculus index Figure 4: Distribution of dental fluorosis group patients'







Figure 5: Distribution of orthodontic group patients'

PI- Plaque index GI-Gingival index OHI-S – Oral hygiene index simplified DI-Debris index CI- Calculus index

DISCUSSION

The present research demonstrates the feasibility of providing education related to oral health by making use of recent developments in technology in India. Widespread use of technology makes intervention easy to coordinate, testing new frontiers in dental public health. Handheld devices such as mobile phones are generally small, lightweight, handy and portable to provide health education in the country's rural areas where 70 % of the population resides. A small device like a mobile phone can be used to educate children about oral health as a basic requirement these days. Mobile phone use has been more interactive and has resulted in increased interest and discussion among the participants. As a dentist in the field of public health, boon in our hand and can be used for the greater good for society. The method was seen as more interactive and interesting to keep the students benefits [22].

Our study is the foremost research associating the effect of text message reminders on their oral hygiene compliance, which involves 5 groups with 4 unique oral diseases.100 students were selected in which majority were female and oral health problems was mostly found in first and second years .(Table 1 & 2) We have observed clinical parameters scores in the interval of 0 days (S0), 30 days (S1), 60 days (S2) and (S3) 90 days.

In Group 1 we observed students having control/healthy oral health. We observed clinical parameters indices measuring plaque gingivitis calculus, debris and oral hygiene – simplex index in the interval of 0, 30, 60, 90 days. Mean values from 0 days to 90 days values did not show any significant improvement which might be happening as they were not receiving the message reminders. (Figure 1).Dental caries has been touted as an important worldwide oral health problem in the world. Despite the significant enhancement in the oral health of population, dental caries are still affecting oral health of all age groups and has been a matter of grave concern by dental professionals over the world[23]

On comparison mean values of DMFT 0 days to 60 days and 0 to 90 days was found to be clinically significant which was similar to the results of study done by Patel [24].Dental plaque is the major causative factor for inflammation of gingiva and caries. Chronic inflammation of gingiva may lead to damage of tissues , and if not taken care of , may lead to the greater destructive stages of periodontal diseases[25].

In Group 3 we observed students having Gingivitis. We observed clinical parameters were decreasing when compared from 0 (S0) to 90 (S3) days . Mean values of Gingival index (0 to 60 days and 0 to 90 days) , plaque index (0 to 60 days and 0 to 90 days) , Debris index (0 to 60 days and 0 to 90 days) , Calculus index (0 to 60 days and 0 to 90 days) and oral hygiene index- simplified (0 to 60 days and 0 to 90 days) were observed clinically significant. Our results were contradicting with the study conducted by Sharma R as in their study text messages did change the knowledge among the groups but decrease in plaque scores in-between groups was not found to be significant . Dental fluorosis is plentiful in various communities around the world, it is common and is known to be a substantial public health problem with oral consideration[26]. It reduces the mineral content of dental enamel by creating porosity, which can make the surface of enamel brittle , increasing its susceptibility to break [27].

In group 4 we observed students having Dental fluorosis. We observed clinical parameters of the dental fluorosis group . No Significant changes were observed in Dental Fluorosis score from 0 to 90 days . Literature related to affect of text messaging among dental fluorosis group is limited .Research has established that oral hygiene maintenance is the least after orthodontic treatment as measured by plaque index. Compliance for oral hygiene is one of the most important factors under the influence of patients during orthodontic treatment [28].

In Group 5 we observed students undergoing orthodontic treatments . We observed clinical parameters of the orthodontic group. Mean values decreased from S0 (0 days) to S3 (90 days) . In comparison, mean values of Gingival index , plaque index, Debris index , Calculus index and oral hygiene index- simplified all were shown to be clinically significant from S0 (0 days) to S3 (90 days). Our results were found similar to a study by Harish et al in which patients in the text message group showcased statistically significant reduction in plaque as equated to that of the control group. ¹⁸ A study conducted by T.Bent Bowen et.al on fifty orthodontic patients showcased a significant decrease in plaque[29] In our study, the gingival index, plaque index, oral hygiene index were used to measure oral hygiene compliance for our control, gingivitis, which was similar to the study by Tufekci (2008) who also conducted a study on orthodontic patients and measured the data using plaque [30].

In our study at baseline (S0), no noticeable difference was seen in the groups of text messaging and control through any of the measuring indices. Also, the text message and control groups were not substantially different for any of the indices used for measurement at the time point S1 (30 days). Clinically significant outcomes were observed at the time points S2 (60 days) and S3 (90 days).

Maintaining a clean mouth is of vital importance for the prevention of significant problems related to oral health , dental caries and diseases of periodontal nature. Well planned and implemented programmes for promotion related to oral health could significantly accelerate the decrease in periodontal problems, dental caries, etc. [31-32[. Our study findings concluded that SMS reminders is effective for improving oral hygiene compliance similar study was done by Marshman *et al* in which Brushing Reminder 4 Good oral Health (BRIGHT) trial was done .An SMS programme for change in behaviour to improve the health associated with oral cavity of younger people .This study concluded BRIGHT trial aims to lessen oral health inequalities through the use of an mHealth intervention, targeting those younger people living in the areas which are devoid of oral health accessibility[33-34].

There is plenty of literature and studies on the effectiveness of SMS on orthodontic group for oral improvement of oral hygiene, but literature is scarce on the effect of oral health reinforcement through SMS which includes all 5 groups that are included in our research. Our research found that sending text message reminders to cell phone patients was a successful way to enhance and pass on information about the value of oral hygiene. Although this study exhibited only progress during a period of 12 weeks, this form of reminder system may be of benefit to those who are unaware of the importance of oral health. There was one drawback that improvement in oral hygiene could be due to performance bias .

CONCLUSION

Common man 's pervasive usage of technology is an affordable and simple medium for oral health education, exploring new frontiers of dental public health. New technological advances can be used effectively to improve oral health with less resources, especially in countries with emerging oral health systems. As a dental public health professional, we can encourage policymakers to suggest telecommunications conglomerate as a social responsibility to submit oral health education text messages free of cost at a societal level.

Cell phone SMS has developed into a new tool that helps to promote healthy habits and reinforce education messages related to oral health via short messaging (SMS) use of mobile devices can be powerful means of enhancing oral hygiene.

CONFLICTS OF INTEREST

No monetary or commercial issues that may lead to conflict of interest.

ETHICAL APPROVAL

Ethical approval was acquired from the institutional board of review of SGT University.

REFERENCES

- 1. Patro BK, Ravi Kumar B, Goswami A, Mathur VP, Nongkynrih B. (2008). Prevalence of dental caries among adults and elderly in an urban resettlement colony of New Delhi. Indian J Dent Res. 19:95-8 2.
- 2. Nakre PD. Harikiran AG. (2013). Effectiveness of oral health education program: A systematic review. J IntSocPrev Community Dent. 3:103-15.
- 3. 7th Global Conference on Health Promotion [internet]. (2020). World Health Organization. http://www.who.int /healthpromotion/conferences/7gchp/en/
- 4. Balappanavar AY, Sardana V, HegdeP. (2013). Social Networking and Oral Health Education. International Journal of Scientific Study.;01(1):16-9.
- 5. Koshy E, Car J, Majeed A. (2008). Effectiveness of mobile-phone short message service (SMS) reminders for ophthalmology outpatient appointments: observational study. BMC Ophthalmol. 8: 9.

- 6. da Costa TM, Salomao PL, Martha AS, Pisa IT, Sigulem D. (2010). The impact of short message service text messages sent as appointment reminders to patients' cell phones at outpatient clinics in Sao Paulo, Brazil. Int J Med Inform. 79: 65 70.
- 7. Chen ZW, Fang LZ, Chen LY, Dai HL. (2008). Comparison of an SMS text messaging and phone reminder to improve attendance at a health promotion center: a randomized controlled trial. J Zhejiang UnivSci B. 9: 34–38.
- 8. Foley J, O'Neill M. (2009). Use of mobile telephone short message service (SMS) as a reminder: the effect on patient attendance. Eur Arch Paediatr Dent. 10: 15–18.
- 9. Krishna S, Boren SA, Balas EA. (2009). Healthcare via cell phones: a systematic review. Telemed J E Health.; 15: 231–240.
- 10. Alamri Marwan. (2010). Consumers, mobile phones and service providers in Saudi Arabia: usage behavior and attitudes. VDM Verlag. ISBN : 978-3639313109
- 11. Waller J, Hodgkin P. (2000). Defaulters in general practice: who are they and what can be done about them? Fam Pract. 17: 252–253.
- 12. Mattheos N, Stefanovic N, Apse P, Attstrom R, Buchanan J, Brown P, Camilleri A, Care R, Fabrikant E, Gundersen S, Honkala S, Johnson L, Jonas I, Kavadella A, Moreira J, Peroz I, Perryer DG, Seemann R, Tansy M, Thomas HF, Tsuruta J, Uribe S, Urtane I, Walsh TF, Zimmerman J, Walmsley AD. (2008). Potential of information technology in dental education. Eur J Dent Educ. 12:85-92.
- 13. Rajesh G, Prasad KV, Mohanty VR, Javali, SB. (2008). Effect of various methods of oral health education on oral health status of high school children in Gadag town randomized control trial. J Indian Assoc Public Health Dent. ; 11: 41-5.
- 14. Sharma R, Hebbal M, Ankola AV, Murugabupathy V. (2011). Mobile-phone text messaging (SMS) for providing oral health education to mothers of preschool children in Belgaum City. J TelemedTelecare. 17(8):432-6.
- 15. Hashemian TS, Kritz-Silverstein D, Baker R. (2015). Text2Floss: the feasibility and acceptability of a text messaging intervention to improve oral health behavior and knowledge. J Public Health Dent. 75(1):34-41.
- 16. Almog D, Devires J, Borrelli J, Kopycka-Kedzierawski D. (2003). The reduction of broken appointment rates through an automated appointment confirmation system. J Dent Educ. 67:1016–1022.
- 17. Roth J, Kula T, Claros A, Kula K. (2004). Effect of a compute regenerated telephone reminder system on appointment attendance. SeminOrthod. 10:190–193.
- 18. Fjeldsoe B, Marshall A, Miller Y. (2009). Behavior change interventions delivered by mobile telephone shortmessage service. Am J Prev Med.36:165–173.
- 19. Hussein W, Hasan K, Jaradat A.(2011). Effectiveness of mobile phone short-message service on diabetes mellitus management; the SMS-DM study. Diabetes Res ClinPract. 94:e24–e26.
- 20. Can S, Marfarlane T, O'Brien K. (2003). The use of postal reminders to reduce non-attendance at an orthodontic clinic: a randomized controlled trial. Br Dent J. 195:199–201.
- 21. Foley J, O'Neill M.(2009). Use of mobile telephone short message service (SMS) as a reminder: the effect on patient attendance. Eur Arch Paediatr Dent. 10:15–19.
- 22. Richa Gupta, Rajesh G, AshwiniRao and Ramya Shenoy. (2017). Role Of Mobile/Phone Text Messaging (Sms) For Providing Oral Health Education To Mothers Of Primary School Children In Mangalore City: A Randomized Controlled Trial. Int. J. Of Adv. Res. **5(6)** : 2154-2160.
- 23. Yadav K, Prakash S. (2016). Dental Caries: A Review. Asian Journal of Biomedical and Pharmaceutical Sciences. ;6(53):1-7.
- 24. Patel J. (2020). Does personalised text messaging influence patients' caries risk?. Evidence-Based Dentistry. 21(3):96-7.
- 25. Iqbal J, Awan R, Parvez MA, ulHaq A, Gardezi AA, Irfan S.(2017). Effectiveness of text message instructions on oral hygiene for orthodontic patients. Pakistan Oral & Dental Journal. 37(2):278-82.
- 26. Petersen, PE. (2003). The world oral health report 2003: continuous improvement of oral health in the 21st century-the approach of the WHO Global Oral Health Programme. Community Dent Oral Epidemiol; 31(1):3-23.
- 27. Alvarez JA, Rezende KMPC, Marocho SMS, Alves FBT, Celiberti P, Ciamponi AL. (2009). Dental fluorosis: exposure, prevention and management. Med Oral Patol Oral Cir Bucal; 14(2):E103-7
- 28. Jejurikar H, Nene S, Kalia A, Gupta G, Mirdehghan N. (2014). Does Text Messaging Reminder Help in the Orthodontic Compliance of Patients to Maintain their Oral Hygiene. J Oral Hyg Health. 2:152.
- 29. Bowen TB, Rinchuse DJ, Zullo T, DeMaria ME. (2015). The influence of text messaging on oral hygiene effectiveness. Angle Orthod; 85:543-58.
- 30. Tufekci E, Casagrande ZA, Lindauer SJ, Fowler CE, Williams KT. (2008). Effectiveness of an essential oil mouthrinse in improving oral health in orthodontic patients. Angle Orthod; 78: 294-298.
- 31. Shenoy RP, Sequeria PS. (2010). Effectiveness of school dental education program in improving oral health knowledge and oral hygiene practices and status of 12 -13 year old school children. Indian J Dent Res. ; 21: 253-9.
- 32. Haleem A, Siddiqui MI, Khan AA. (2012). School-based strategies for oral health education of adolescents A cluster randomized controlled trial. BMC Oral Health;12(1):54.
- 33. Marshman Z, Ainsworth H, Chestnutt IG, Day P, Dey D, El Yousfi S, Fairhurst C, Gilchrist F, Hewitt C, Jones C, Kellar I. (2019). Brushing Reminder 4 Good oral HealTh (BRIGHT) trial: does an SMS behaviour change programme with a classroom-based session improve the oral health of young people living in deprived areas? A study protocol of a randomised controlled trial. Trials. 20(1):452.

34. Jadhav HC, Dodamani AS, Karibasappa GN, Naik RG, Khairnar MR, Deshmukh MA, Vishwakarma P. (2016). Effect of Reinforcement of Oral Health Education Message through Short Messaging Service in Mobile Phones: A Quasi-Experimental Trial. Int J Telemed Appl. 2016:7293516.

CITATION OF THIS ARTICLE

A Mishra, A Bhargava, S Tandon and S Chand. Effectiveness of Text Messaging in Improving Oral Hygiene Status and Utilization of Dental Services in College Students. Bull. Env.Pharmacol. Life Sci., Spl Issue [2]: 2022: 326-334