

# Randomized Controlled Trial: The effects of Short Message Service on mothers' oral health knowledge and practice

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**Objective:** Mobile health has provided an effective means to educate, empower, and provide access to health services for individuals and groups. This study aimed to compare the effects of gain-frame and loss-frame SMS on the knowledge and practice of mothers with children under the age of six years regarding pediatric oral health. **Research design:** This randomized controlled trial was conducted in kindergartens and preschool centers of Shiraz, Iran in 2016. There were 71 mothers in the gain-frame group, 66 in the loss-frame group and 74 in the control group. The data were collected before and three-four weeks after the intervention. Data analysis used descriptive statistics, independent t-test, ANOVA, Pearson correlation test, ANCOVA, and post-hoc LSD test (Least Significant Difference). **Results:** There was a significant difference between the control (8.83±2.03) and gain-frame (11.8±2.17, p<0.001) and loss-frame (12.09±1.94, p<0.001) groups for post-test knowledge scores. A difference was also observed between the control group (56.27±11.53) and gain-frame (60.8±7.77, p<0.001) and loss-frame (60.25±8.96, p<0.001) groups for post-test practice scores. No difference was found between the gain-frame and loss-frame groups for the post-test scores (p=0.69). **Conclusion:** Gain-frame and loss-frame SMS had similar impacts on the mothers' knowledge and practices about their children's oral health. However, both improved the mothers' knowledge and practice. Therefore, regardless of the style of text message framing, this method may be useful for educating mothers.

**Keywords:** Telemedicine, Text messaging, Knowledge, Oral health, Child, Mothers

## Introduction

Children's oral health plays an important role in their nutrition, speech, and aesthetics. On the other hand, development of dental caries can present a major threat to children's general health (Ramakrishnan *et al.*, 2019). Therefore, children have become one of the main target groups of World Health Organization (WHO) in the field of oral and dental health. The global prevalence of tooth decay in children is high. Between 20% and 90% of six-year-old European children are reported to have dental caries (WHO, 2016). The prevalence of tooth decay was 66.9% in five-year-old children in China (Sun *et al.*, 2017). A study in Tehran, Iran reported that the prevalence of dental caries in children was as high as 63% (Kalantari *et al.*, 2017). Dental diseases are considered to be the fourth most costly diseases, some of which, including gum disease and tooth decay are preventable (Batchelor, 2014). Therefore, appropriate education and prevention planning may reduce healthcare costs.

One goal of health education programs is to raise public awareness to prevent health-related problems. In this regard, oral health education is focused on the prevention of oral and dental disorders. The evidence regarding the effectiveness of health education on oral health status

is mixed. Two independent systematic reviews showed that health education has no significant effects on the reducing dental caries; and its effects on prevention of plaque formation is temporary (Kay and Locker, 1996; Soldani and Wu, 2018). On the other hand, dental health education to children in kindergartens, and their teachers and parents, along with supervised tooth brushing with fluoride toothpaste reduced caries dmfs increment in the children (Rong *et al.*, 2003). Furthermore, other studies indicated that health education improved children's oral health status (Manchanda *et al.*, 2014; Nakre and Harikiran, 2013; Sharma *et al.*, 2011). The effectiveness of these programs can be enhanced through the involvement of the children's significant others like their parents and caregivers (Nakre and Harikiran, 2013).

Mothers can play a significant role in their children's dental health. They can affect their families' oral health through health behavior models, education, helping with brushing and using mouthwash, and diet modifications such as reducing daily sugar consumption (de Castilho, *et al.*, 2013; Finlayson *et al.*, 2007; Manchanda *et al.*, 2014; Nisar, 2015). Children whose mothers had more favorable knowledge of oral health had healthier teeth (Soltani *et al.*, 2016).

Furthermore, adequate maternal knowledge could provide better healthcare for children and improve their oral health (Nisar, 2015). However, some mothers have inappropriate knowledge and practices regarding their children's oral and dental health (Haghnegahdar *et al.*, 2014; Naderifar *et al.*, 2010; Soltani *et al.*, 2013). Hence, measures should be taken to promote their awareness and practice in this field (Rabiei *et al.*, 2015).

With the growing number of mobile phone users, mobile Health (m-Health) has provided an effective means to communicate, educate, motivate, empower, and provide access to health services for individuals and groups (Higgs *et al.*, 2014; Salehi *et al.*, 2019). The use of m-Health, to deliver the right message to the right audience at the right time has been the subject of much research (Schilling *et al.*, 2013). Several studies have shown that Short Message Service (SMS) is a useful tool in health education. Such services could be used to provide diabetes-related information, smoking cessation interventions, lifestyle-focused advice (motivational reminders, and support to change behaviors) on cardiovascular risk factors, and obesity treatment (Wong *et al.*, 2013; Müssener *et al.*, 2015; Chow *et al.*, 2015; Woolford *et al.*, 2010).

Selection of an appropriate framework for the SMS may influence the effectiveness of its transfer (Pakpour *et al.*, 2014). However, there is no consensus on the most effective framework (Gallagher and Updegraff, 2012). One theory used to explain the impact of message framing is prospect theory, which explains how people make decisions in difficult circumstances (Tversky and Kahneman, 1985). According to this theory, text message frameworks may be loss-frame or gain-frame. Gain-frame messages emphasize the benefit of adherence to instructions, whereas loss-frame highlight the disadvantages of non-adherence (Schilling *et al.*, 2013).

There is less evidence regarding the effectiveness of SMS in disease prevention in developing countries (Cole-Lewis and Kershaw, 2010). The positive impact of text messaging has been shown on educating the mothers of preschool children about oral health (Sharma *et al.*, 2011). Some studies have shown that intervention through SMS could be effective in changing health behaviors through gain-frame and loss-frame messages (Gallagher and Updegraff, 2012). However, researchers have reported differences between gain-frame and loss-frame messages. Some reports indicate that gain-frame messages are effective (Ferrer *et al.*, 2012; Gallagher and Updegraff, 2012; Ghajari *et al.*, 2016; Kim, 2014; Latimer *et al.*, 2008; Updegraff *et al.*, 2015), whereas others came to contradictory conclusions (Abhyankar *et al.*, 2008; Mays *et al.*, 2017; Pakpour *et al.*, 2014; Williams *et al.*, 2001).

In summary, it is necessary to educate mothers about their children's oral health (Aurangjeb and Zaman, 2013) and health education through SMS has found to be beneficial. However, the most effective form of message framing has to be determined. Therefore, this study aimed to compare the effectiveness of gain-frame and loss-frame messages in changing the oral health related knowledge and practices of mothers with children less than six years of age.

## Methods

This randomized controlled trial (IRCT-2016042727647N1) with three groups and pretest/post-test design was conducted in Shiraz, Iran from July to September 2016.

Considering  $\alpha=0.05$ , power=0.80, and effect size ( $\Delta$ )=0.5 and using the following formula, a 192-subject sample size was determined for the study ( $n=64$  in each group)  $N = 2 (z_{\alpha} - z_{\beta})^2 / \Delta^2 = 16 / (0.5^2) = 64$ . Allowing for a 25% dropout rate, 240 participants ( $n=80$  in each group) were recruited. The inclusion criteria were having a mobile phone, being able to read and write, having at least one child less than six years old and agreeing to participate in the study. The exclusion criteria were having been educated in fields related to dental health or dentistry and having differently-abled children (because of their different educational needs). The list of 200 kindergartens in Shiraz was obtained from the General Bureau Welfares of Fars province. Then, Shiraz was divided into north and south as mothers' knowledge and practice might differ with their socioeconomic circumstances. With the kindergarten as the unit of randomization, random cluster sampling (using a table of random numbers) was used to select three kindergartens from each geographical area, which were assigned to the gain-frame, loss-frame, or control groups. Random allocation, participant registration, and interventions were performed by individuals who were not part of the study.

All kindergartens agreed to participate. The mothers who came to the kindergartens were invited to participate. Overall, 240 mothers (80 per group) from six kindergartens completed pretest questionnaires. During the study, two mothers were excluded because they did not wish to receive SMS and 27 mothers did not complete the post-test questionnaires. Thus, 211 mothers completed the post-test questionnaires ( $n=71$  in the gain-frame group,  $n=66$  in the loss-frame group, and  $n=74$  in the control group). The attrition rate was 11.3% in the gain-frame group, 17.5% in the loss-frame group, and 7.5% in the control group (Figure 1).

The intervention included 20 gain-frame messages to Group 1 and 20 loss-frame messages to the Group 2. Gain-frame messages focused on the benefits of adherence to oral hygiene. Loss-frame messages focused on the disadvantages of non-adherence to oral hygiene (Additional file available at <https://mgsch.sums.ac.ir/page-databank/fa/96/form/pld40686>).

Initially, the SMS content was developed based on Dean, Avery, and McDonald (2015), but was revised into loss-frame and gain-frame formats. Three pediatric dentistry professors confirmed the SMS contents and an educational psychologist and an educational management specialist confirmed the message frameworks. The messages were sent daily for 20 days, simultaneously to both intervention groups every morning between 8 and 12 a.m. We anticipated some mothers might block mass media messaging or advertising messages, therefore the messages were sent with a registered number managed by a tele-communications operator. In addition, to ensure that the messages were received, a researcher called the mothers randomly to enquire if they had received them. The control group received no interventions.

Data were collected using the same instrument before

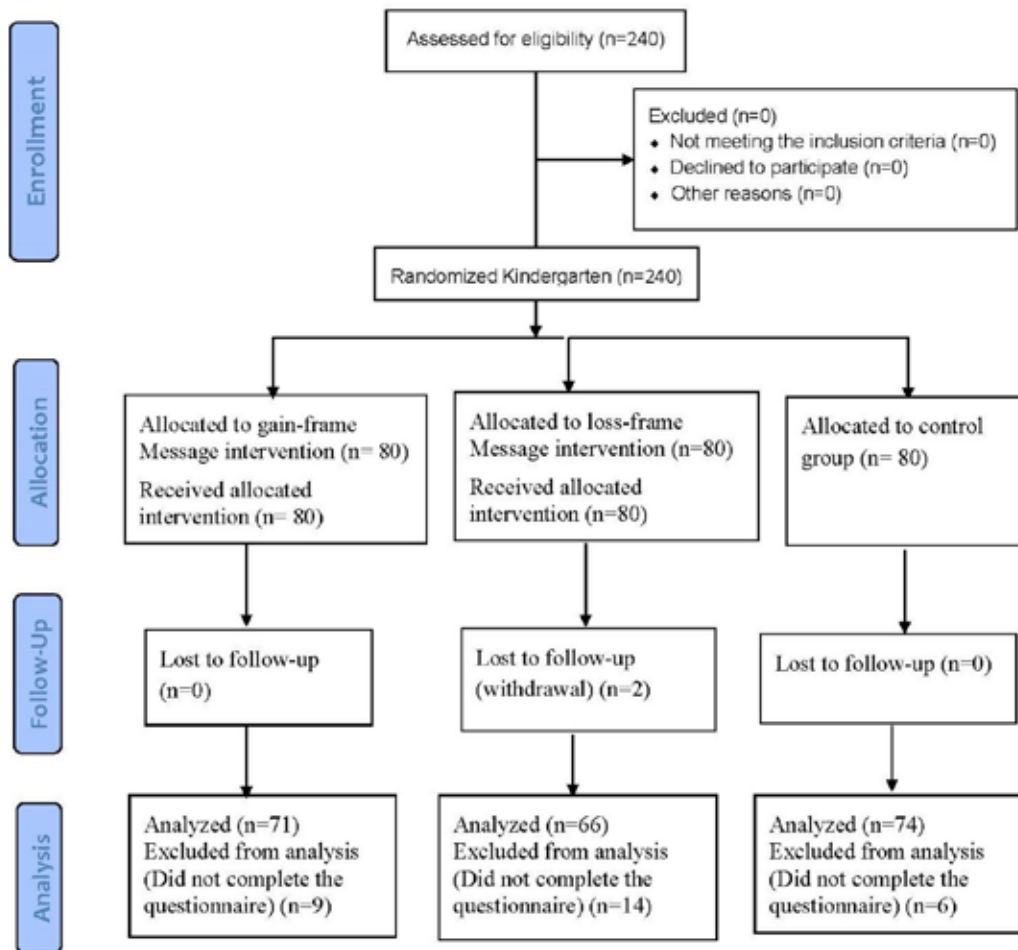


Figure 1. Consort flow chart of the study

and three to four weeks after the intervention. The researcher-made questionnaire contained 15 demographic questions, 15 multiple-choice questions (true=1, false=0) about the mothers' knowledge (0-4, low; 5-10, moderate; 11-15, good), and 23 questions on a five-option Likert scale (no idea=1, always=4) about the mothers' oral health practices for their children. Scores were classified as 0-29, poor; 30-61, medium and 62-92, good. The knowledge questionnaire enquired about the mothers' awareness of primary and permanent teeth, the role of fluoride in toothpaste, children's bad teeth, causes of children's tooth decay, ways to reduce decay, and regular visits to a dentist. The practice questionnaire measured the mothers' performance on how and when to brush a child's teeth, monitoring and encouraging tooth brushing, controlling the food consumed by children, replacing a worn toothbrush, and going to the dentist. The questionnaire content was based on textbooks on children's oral health. The validity of the questionnaire was confirmed by a survey of 10 dentistry or related specialists. To ensure the reliability of the questionnaire, it was completed by 30 eligible mothers who did not take part in the study. The reliability was confirmed by Kuder-Richardson coefficient of 0.71 for knowledge and Cronbach's alpha coefficient of 0.85 for practice dimensions.

Statistical analysis was applied for mothers who provided complete data and used SPSS statistical software, version 19.0 for descriptive statistics, independent t-test, ANOVA, Pearson correlation test, ANCOVA, and

post-hoc LSD test (Least Significant Difference).  $P < 0.05$  was considered to be statistically significant. Modified Intention-To-Treat (ITT) analysis was used for statistical analysis of the lost-to-follow-up data. The participants were excluded if they withdrew from the study for any reason and their data were not available. Analysis was performed on the existing data regardless of whether participants followed the study protocol (Abraha and Montedori, 2010; Joseph *et al.*, 2015).

## Results

Most mothers were aged between 31 and 40 years. Baseline demographic features of the gain-frame, loss-frame, and control groups were similar (Table 1).

The mean ages of the children in the gain-frame, loss frame, and control groups were  $4.41 \pm 1.08$ ,  $4.54 \pm 1.08$ , and  $4.83 \pm 1.02$  years, respectively. The mean age of the entire sample was  $4.60 \pm 1.07$  (ranging from 1.5 to 6) years.

At baseline, the knowledge and practice scores were broadly similar by allocation group and demographic data. Mothers who were not working had better oral health knowledge and those who had older children had better oral health practices (Table 2). Therefore, ANCOVA was used to moderate the effects of these potential confounders on the outcomes.

ANCOVA showed differences in post-test knowledge and practice scores were higher in the gain frame and loss frame groups than in the control group after the

**Table 1.** Demographic characteristics of the participants at baseline

Group		Characteristics		
		Gain-frame group (n=71) %	Loss-frame group (n=66) (%)	Control group (n=74) (%)
Mother's age group (years)	21-30	25.4	21.2	35.6
	31-40	69.0	68.2	53.4
	≥ 41	5.6	10.6	11
Mother's education level	Under diploma and diploma	21.1	21.2	37
	BSc/BA	57.7	65.2	52.1
	MSc, MA, and higher	21.1	13.6	11
Income level	Low	11.4	14.1	11.9
	Average	55.7	43.8	68.7
	High	32.9	42.2	19.4
Mother's employment status	Employed	29	38.1	45.8
	Unemployed	71	61.9	54.2
Geographical location	Uptown	53.5	53.0	51.4
	Downtown	46.5	47.0	48.0
Child's gender	Male	52.2	53.6	57.4
	Female	47.8	46.0	42.6

**Table 2.** Mothers' scores for knowledge and practices about children's oral health at baseline.

Characteristics		Variables	
		Knowledge Mean±SD	Practice Mean±SD
Group	Gain-frame SMS	8.29±2.35	54.43±7.37
	Loss-frame SMS	8.45±2.16	53.53±9.68
	Control	8.28±2.27	54.85±8.52
Mother's age group (years)	21-30	8.24±2.33	55.77±7.54
	31-40	8.27±2.27	53.36±8.46
	≥ 41	9.10±1.88	56.26±11.28
Mother's education level	Under diploma and diploma	8.07±2.62	53.8±9.94
	BSc/BA	8.31±2.16	54.09±8.25
	MSc, MA, and higher	8.96±1.86	55.28±7.52
Income	Low	7.72±2.68	52.8±10.44
	Average	8.31±2.19	54.32±8.87
	High	8.69±2.24	54.44±7.43
Mother's employment status	Employed	7.62±2.34	54.32±8.27
	Unemployed	8.74±2.13	54.26±8.90
Geographical location	Uptown	8.48±2.28	55.03±7.84
	Downtown	8.18±2.22	53.31±9.31
Child's gender	Male	8.51±2.09	53.79±9.22
	Female	8.01±2.33	54.29±8.20
Child's age		r = -0.02	r= 0.19

intervention (Table 3). This was supported by LSD tests that indicated significant differences between the control group and the gain-frame ( $p<0.001$ ) and loss-frame ( $p<0.001$ ) groups concerning post-test knowledge and practice scores ( $p=0.004$  and  $p<0.008$  for the gain frame and loss-frame groups respectively). However, no significant differences were observed between the gain-frame and loss-frame groups with respect to the post-test knowledge or practice scores ( $p=0.34$  and  $p=0.85$  respectively).

### Discussion

This study explored the effectiveness of gain-frame and loss-frame oral health educational messages in a group of mothers with children under six years old. The mothers were responsive to both loss-frame and gain-frame oral health messages. Accordingly, the effect sizes were large for changes in the knowledge in both the gain- and loss-frame groups as well as for practices in the gain-frame group ( $>0.8$ ). Additionally, the effect size was medium for the practice scores of the loss-frame group. However, gain-frame and loss-frame messages had similar impacts on the mothers' knowledge and practices about their children's oral health.

To the best of our knowledge, this is the first study to examine the effects of oral health message framing focusing on a population of mothers in Asia. Up to now, a small number of studies have reviewed the effect of health message framing on oral health. However, studies have been conducted in different populations and health conditions from the current study.

Our findings showed similar outcomes from gain-frame and loss frame messages, which is consistent with the results obtained by Ghajari et al. (2016) who reported no differences between their effects on the practices of adolescent girls about consumption of calcium enriched food. However, they found that loss-frame messages significantly improved the adolescents' knowledge. A meta-analysis reported that the style of message framing did not influence sun protective behaviors (O'Keefe and Wu, 2012). Similarly, the message frame made no difference physical activity, but the intention to do more activity was higher amongst the people receiving gain-frame messages (van't Riet et al., 2009). A study by Updegraff et al. (2015) also showed similar results where the frame of video messages did not influence young people's flossing practice.

In contrast to our findings, other studies have indicated that one type of message framing was more effective than the other. In some studies, gain-frame messages were superior to loss-frame ones in preventive health behaviors (Ferrer et al., 2012; Gallagher and Updegraff, 2012; Ghajari et al., 2016; Rothman and Salovey, 1997), promoting physical activity (Latimer et al., 2008), and improving attitudes towards breast cancer screening and memorizing the related information (Kim, 2014). In other studies, however, loss-frame messages were more effective than gain-frame. For instance, mothers' intention to allow their children to have the Measles, Mumps, and Rubella (MMR) vaccination (Abhyankar et al., 2008), self-breast examination (Williams et al., 2001), and colorectal cancer screening (Ferrer et al., 2012) increased with loss-frame messages. Another study also showed that loss-frame pamphlets improved students' oral health attitudes and practices more than gain-frame pamphlets (Pakpour et al., 2014).

The present study revealed similar effects of gain-frame and loss-frame messages on the mothers' knowledge and practice about their children's oral health. The reason for the difference between our findings and those of others is not clear. Some authors believe that the effectiveness of message framing is related to culture. For instance, Brick et al. (2016) saw American culture as self-oriented, with American individuals more likely to take advantage of actions. They showed gain-frame text messages to increase decisions to use dental floss and to remember the information in individuals who were more in touch with American culture. However, loss-frame messages were more effective in those who were less in touch with American culture. The participants who received messages with no framing were similar to those who had not received any messages. Moreover, Hamamura et al. (2009) found that Japanese students remembered more loss-frame, while American ones remembered more gain-frame information. Furthermore, managers in the industrial sectors of Fars province, Iran were more inclined to avoid losses (Mosleh Shirazi et al., 2011). Consequently, there is insufficient evidence to confirm the role of culture in message framing preferences. Differences between the findings of the current and other studies of the impact of message framing might be related to differences in the content, type, and number of messages, duration of the intervention, and the time interval until the post-test. The studied variables and populations of most previous studies were also different from those of the current investigation.

**Table 3.** Between-group comparison of the mothers' post-test knowledge and practices regarding children's oral health

Groups*	Variable			
	Knowledge		Practice	
	Mean ± SD	P-value*	Mean ± SD	P-value**
Gain-frame SMS	11.77 ± 2.16	<0.001	60.69±7.77	0.006
Loss-frame SMS	12.06 ± 1.92		60.39±8.88	
Control	8.86 ± 2		56.05±11.46	

\* ANCOVA; mother's employment status was used as covariate.

\*\* ANCOVA; child's age used as covariate.

However, both framing messages were effective in improving mothers' knowledge and practice regardless of framing. The positive effects of health messages have been demonstrated in other studies. A study in India revealed an increase in the knowledge, practice, and attitudes of mothers towards their preschool children's oral health in both groups using pamphlet and SMS education. However, the increase was higher in the group receiving SMS (Sharma *et al.*, 2011). In a study in Tehran, educational SMS increased the knowledge, practice, and attitude of non-medical students in the field of breast examination (Aein *et al.*, 2014). Similarly, Goodarzi *et al.* (2012) demonstrated that educational SMS was effective in reducing blood glucose and promoting knowledge, attitude, practice, and self-efficacy in patients with diabetes. A systematic review revealed that mobile text messages improved the patients' medication adherence (Sarabi *et al.*, 2016).

One limitation of the present study was that the intervention group participants knew they were a part of the study, so preventing blinding. In addition, mothers' knowledge and practice were self-reported and their actual knowledge and practice or their health outcomes were not assessed directly. Nor were fathers included in the investigation. Therefore, similar studies are recommended to be conducted on both parents. Further studies on the effectiveness of this intervention in other populations are also warranted.

### Conclusion

Both loss-frame and gain-frame messages improved the mothers' knowledge and self-reported practice. Therefore, both text messages could be used to educate mothers regarding their children's oral health. The scope for using mobile phones for health education warrants further investigation. Yet, further studies are recommended to evaluate the long-term effects of the two frameworks.

### Acknowledgments

The authors would like to thank Mr Ali Mohammad Keshavarz at the Center for Development of Clinical Research of Nemazee Hospital for his statistical assistance. They are also grateful for Ms. A. Keivanshekouh at the Research Improvement Center of Shiraz University of Medical Sciences for improving the use of English in the manuscript.

### Funding

This study was extracted from an MSc thesis funded by the Research Vice-chancellor of Shiraz University of Medical Sciences, Shiraz, Iran (grant No. 94-01-07-11181). The funding body did not play any roles in the design of the study, collection, analysis, and interpretation of the data, and writing the manuscript.

### Ethics approval and consent to participate

The present study was approved by the Ethics Committee of Shiraz University of Medical Sciences, Shiraz, Iran (IR.SUMS.REC.1395.40). Written informed consent forms were obtained from all participants and confidentiality of the information was assured.

### References

- Abhyankar, P., O'Connor, D.B. and Lawton, R. (2008): The role of message framing in promoting MMR vaccination: Evidence of a loss-frame advantage. *Psychology, Health and Medicine* 13, 1-16.
- Abraha, I. and Montedori, A. (2010): Modified intention to treat reporting in randomised controlled trials: systematic review. *British Medical Journal* 340, c2697.
- Aein, A., Lamyian, P., Heidarnia, A., Maghari, A.H. and Maasoumi, P. (2014): Survey of the Impact of Using Text Messaging Educational Method on Breast Self Examination in Female Students of Non-medical Fields in 2013. *Current Research Journal of Biological Sciences* 6, 134-140.
- Aurangzeb, A. and Zaman, T. (2013): Effect of Parents Education on Child's Oral Health. *Bangladesh Journal of Dental Research and Education* 3, 26-28.
- Batchelor, P. (2014): Is periodontal disease a public health problem? *British Dental Journal* 217, 405.
- Brick, C., McCully, S.N., Updegraff, J.A., Ehret, P.J., Areguin, M.A. and Sherman, D.K. (2016): Impact of cultural exposure and message framing on oral health behavior: exploring the role of message memory. *Medical Decision Making* 36, 834-843.
- Chow, C.K., Redfern, J., Hillis, G.S., Thakkar, J., Santo, K., Hackett, M.L., Jan, S., Graves, N., de Keizer, L. and Barry, T. (2015): Effect of lifestyle-focused text messaging on risk factor modification in patients with coronary heart disease: a randomized clinical trial. *Journal of the American Medical Association* 314, 1255-1263.
- Cole-Lewis, H. and Kershaw, T. (2010): Text messaging as a tool for behavior change in disease prevention and management. *Epidemiologic Reviews* 32, 56-69.
- de Castilho, A.R.F., Mialhe, F.L., de Souza Barbosa, T. and Puppim-Rontani, R.M. (2013): Influence of family environment on children's oral health: a systematic review. *Jornal de Pediatria (Versão em Português)* 89, 116-123.
- Dean, J.A. (2015): *McDonald and Avery's Dentistry for the Child and Adolescent-E-Book*, Elsevier Health Sciences.
- Ferrer, R.A., Klein, W.M., Zajac, L.E., Land, S.R. and Ling, B.S. (2012): An affective booster moderates the effect of gain-and loss-framed messages on behavioral intentions for colorectal cancer screening. *Journal of Behavioral Medicine* 35, 452-461.
- Finlayson, T.L., Siefert, K., Ismail, A.I. and Sohn, W. (2007): Maternal self-efficacy and 1-5-year-old children's brushing habits. *Community Dentistry Oral Epidemiology* 35, 272-281.
- Gallagher, K.M. and Updegraff, J.A. (2012): Health message framing effects on attitudes, intentions, and behavior: a meta-analytic review. *Annals of Behavioral Medicine* 43, 101-116.
- Ghajari, H., Shakerinejad, G., Hosseini, A. and Haghghi Zadeh, M. (2016): A study of the impact of message framing on calcium-rich foods intake in high school girls: a perspective of regulatory focus theory. *Payesh* 15, 163-171 [persian].
- Goodarzi, M., Ebrahimzadeh, I., Rabi, A., Saedipoor, B. and Jafarabadi, M.A. (2012): Impact of distance education via mobile phone text messaging on knowledge, attitude, practice and self efficacy of patients with type 2 diabetes mellitus in Iran. *Journal of Diabetes and Metabolic Disorders* 11, 10.
- Haghnegahdar, A., Bronoosh, P. and Aidenlou, S. (2014): Assessment Of Mothers' knowledge Of Sequence And Time Of Deciduous And Permanent Teeth Eruption In Children. *Sadra Medical Sciences Journal* 2, 43-53.
- Hamamura, T., Meijer, Z., Heine, S.J., Kamaya, K. and Hori, I. (2009): Approach—Avoidance motivation and information processing: A cross-cultural analysis. *Personality and Social Psychology Bulletin* 35, 454-462.
- Higgs, E.S., Goldberg, A.B., Labrique, A.B., Cook, S.H., Schmid, C., Cole, C.F. and Obregon, R.A. (2014): Understanding the role of mHealth and other media interventions for behavior change to enhance child survival and development in low- and middle-income countries: an evidence review. *Journal of Health Communication* 19, 164-189.

- Joseph, R., Sim, J., Ogollah, R. and Lewis, M. (2015): A systematic review finds variable use of the intention-to-treat principle in musculoskeletal randomized controlled trials with missing data. *Journal of Clinical Epidemiology* **68**, 15-24.
- Kalantari, B., Rahmanna, J., Hatami, H., Karkhaneh, S., Farsar, A., Sharifpoor, A. and Zahedi, B. (2017): The prevalence of dental caries in primary molars and its related factors in 6 and 7 years old children in Shemiranat health center. *Journal of Health in the Field* **1**.
- Kay, E.J. and Locker, D. (1996): Is dental health education effective? A systematic review of current evidence. *Community Dentistry Oral Epidemiology* **24**, 231-235.
- Kim, H.J. (2014): The impacts of vicarious illness experience on response to gain-versus loss-framed breast cancer screening (BCS) messages. *Health Communication* **29**, 854-865.
- Latimer, A.E., Rench, T.A., Rivers, S.E., Katulak, N.A., Cadmus, L., Hicks, A., Hodorowski, J.K. and Salovey, P. (2008): Promoting participation in physical activity using framed messages: An application of prospect theory. *British Journal of Health Psychology* **13**, 659-681.
- Listl, S., Galloway, J., Mossey, P. and Marcenés, W. (2015): Global economic impact of dental diseases. *Journal of Dental Research* **94**, 1355-1361.
- Manchanda, K., Sampath, N. and Sarkar, A.D. (2014): Evaluating the effectiveness of oral health education program among mothers with 6-18 months children in prevention of early childhood caries. *Contemporary Clinical Dentistry* **5**, 478-483.
- Mays, D., Hawkins, K.B., Bredfeldt, C., Wolf, H. and Tercyak, K.P. (2017): The effects of framed messages for engaging adolescents with online smoking prevention interventions. *Translational Behavioral Medicine* **7**, 1-8.
- Mosleh Shirazi, A.N., Namazi, M., Mohammadi, A. and Rajabi, A. (2011): Prospect theory and modeling pattern in industrial manager decision making. *Journal of Industrial Management Perspective* **10**, 9-33.
- Müssener, U., Bendtsen, M., Karlsson, N., White, I.R., McCambridge, J. and Bendtsen, P. (2015): SMS-based smoking cessation intervention among university students: study protocol for a randomised controlled trial (NEXit trial). *Trials* **16**, 140.
- Naderifar, M., Ghaljaei, F. and Akbarizadeh, M.R. (2010): Determination of the mothers' practice about orodental health of their children up to six years old. *Zahedan Journal of Research in Medical Sciences* **12**, 43-48.
- Nakre, P.D. and Harikiran, A.G. (2013): Effectiveness of oral health education programs: A systematic review. *Journal of International Society of Preventive and Community Dentistry* **3**, 103-115.
- Nisar, N. (2015): Role of Mothers in Prevention of Dental Caries: A Systematic Review. *Journal of Dental Health, Oral Disorders and Therapy* **3**, 00091.
- O'Keefe, D.J. and Wu, D. (2012): Gain-framed messages do not motivate sun protection: A meta-analytic review of randomized trials comparing gain-framed and loss-framed appeals for promoting skin cancer prevention. *International Journal of Environmental Research and Public Health* **9**, 2121-2133.
- Pakpour, A.H., Yekaninejad, M.S., Sniehotta, F.F., Updegraff, J.A. and Dombrowski, S.U. (2014): The effectiveness of gain-versus loss-framed health messages in improving oral health in Iranian secondary schools: a cluster-randomized controlled trial. *Annals of Behavioral Medicine* **47**, 376-387.
- Rabiei, L., Masoodi, R. and Shirani, M. (2015): Evaluation of the Knowledge, Attitude, and Practice of Mothers Visiting Dental Clinics in Isfahan about Two-Five-Year-Old Children's Dental Care. *Nursing of the Vulnerables* **2**, 55-64.
- Radic, M., Benjak, T., Vukres, V.D., Rotim, Z. and Zore, I.F. (2015): Presentation of DMFT/dmft Index in Croatia and Europe. *Acta Stomatologica Croatica* **49**, 275-284.
- Ramakrishnan, M., Banu, S., Ningthoujam, S. and Samuel, V.A. (2019): Evaluation of knowledge and attitude of parents about the importance of maintaining primary dentition-A cross-sectional study. *Journal of Family Medicine and Primary Care* **8**, 414.
- Rong, W.S., Bian, J.Y., Wang, W.J. and Wang, J.D. (2003): Effectiveness of an oral health education and caries prevention program in kindergartens in China. *Community Dentistry Oral Epidemiology* **31**, 412-416.
- Rothman, A.J. and Salovey, P. (1997): Shaping perceptions to motivate healthy behavior: the role of message framing. *Psychological bulletin* **121**, 3.
- Salehi, F., Kermani, Z.A., Khademian, F. and Aslani, A. (2019): Critical Appraisal of Mental Health Applications. *Studies in Health Technology and Informatics* **261**, 303-308.
- Sarabi, R.E., Sadoughi, F., Orak, R.J. and Bahaadinbeigy, K. (2016): The effectiveness of mobile phone text messaging in improving medication adherence for patients with chronic diseases: a systematic review. *Iranian Red Crescent Medical Journal* **18**, e25183.
- Schilling, L., Bennett, G., Bull, S., Kempe, A., Wretling, M. and Staton, E. (2013): *Text Messaging in Healthcare Research Toolkit*. Center for Research in Implementation Science and Prevention (CRISP), University of Colorado School of Medicine.
- Sharma, R., Hebbal, M., Ankola, A.V. and Murugabupathy, V. (2011): Mobile-phone text messaging (SMS) for providing oral health education to mothers of preschool children in Belgaum City. *Journal of Telemedicine and Telecare* **17**, 432-436.
- Soldani, F. and Wu, J. (2018): School based oral health education. *Evidence-based Dentistry* **19**, 36.
- Soltani, R., Ali Eslami, A., Mahaki, B., Alipoor, M. and Sharifirad, G. (2016): Do maternal oral health-related self-efficacy and knowledge influence oral hygiene behavior of their children?. *International Journal of Pediatrics* **4**, 2035-2042.
- Soltani, R., Sharifirad, G., Hasanzadeh, A., Golshiri, P. and Barati, M. (2013): Mothers' knowledge and attitude on oral health preschool children in Isfahan. *Iranian Journal of Health Sciences* **9**, 712-719.
- Sullivan, G.M. and Feinn, R. (2012): Using effect size—or why the P value is not enough. *Journal of Graduate Medical Education* **4**, 279-282.
- Sun, X., Bernabé, E., Liu, X., Gallagher, J.E. and Zheng, S. (2017): Early life factors and dental caries in 5-year-old children in China. *Journal of Dentistry* **64**, 73-79.
- Tversky, A. and Kahneman, D. (1985): The framing of decisions and the psychology of choice. *Environmental Impact Assessment, Technology Assessment, and Risk Analysis: Springer*, 107-129.
- Updegraff, J.A., Brick, C., Emanuel, A.S., Mintzer, R.E. and Sherman, D.K. (2015): Message framing for health: Moderation by perceived susceptibility and motivational orientation in a diverse sample of Americans. *Health Psychology* **34**, 20.
- Van't Riet, J., Ruiters, R.A., Werrij, M.Q. and de Vries, H. (2009): Investigating message-framing effects in the context of a tailored intervention promoting physical activity. *Health Education Research* **25**, 343-354.
- WHO. (2016): Oral Health Data and Statistics. <http://www.euro.who.int/en/health-topics/disease-prevention/oral-health/data-and-statistics>.
- Williams, T., Clarke, V. and Borland, R. (2001): Effects of message framing on breast-cancer-related beliefs and behaviors: the role of mediating factors. *Journal of Applied Social Psychology* **31**, 925-950.
- Wong, C.K., Fung, C.S., Siu, S., Lo, Y.Y., Wong, K., Fong, D.Y. and Lam, C.L. (2013): A short message service (SMS) intervention to prevent diabetes in Chinese professional drivers with pre-diabetes: a pilot single-blinded randomized controlled trial. *Diabetes Research and Clinical Practice* **102**, 158-166.
- Woolford, S.J., Clark, S.J., Strecher, V.J. and Resnicow, K. (2010): Tailored mobile phone text messages as an adjunct to obesity treatment for adolescents. *Journal of Telemedicine and Telecare* **16**, 458-461.