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Original Article

Evaluation of the Effect of Education on the Knowledge and Attitudes of Primary Students' Parents About Fissure Sealants and Fluoride Therapy in Qazvin, Iran, 2020

Maryam Shokri Mozhdehi[1], Maryam Karimi Madani[2*], Monirsadat Mirzadeh[3], Mohammad Javad Khosraviani[4]

[1]Department of Pediatric, Faculty of Dentistry, Qazvin University of Medical Sciences, Qazvin, Iran
[2]Department of Orthodontics, Faculty of Dentistry, Qazvin University of Medical Sciences, Qazvin, Iran
[3]Metabolic Diseases Research Center, Research Institute for Prevention of Non-Communicable Diseases, Qazvin University of Medical Sciences, Qazvin, Iran
[4]Department of Civil Engineering, Qazvin Branch, Islamic Azad University, Qazvin, Iran

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***Corresponding author:**
Maryam Karimi Madani,
Email: maryam.karimi.dr@gmail.com

Abstract

Background: Raising the level of knowledge and attitudes of parents about preventive dental services can be highly important in encouraging them to demand and use this type of service and consequently reduce tooth decay in children. The purpose of this study was to determine the effect of education on the knowledge and attitudes of parents of primary school children in Qazvin about fissure sealants and fluoride therapy.

Methods: This semi-experimental study used a before-after, questionnaire-based intervention. The study population consisted of parents of primary school students (grades 1–6) in Qazvin during the 2020 academic year. A reliable and valid questionnaire was used, which included demographic questions, parents' knowledge about fluoride and fissure sealant therapy, and their attitudes toward these types of care. After completing the online questionnaire, parents received educational videos on fissure sealant and fluoride therapy. Their knowledge and attitudes were reassessed four weeks later. The frequency of participants' responses and the sum of scores were extracted, and one-way ANOVA (examining the relationship between knowledge and education) statistical analysis was performed with the help of an independent sample test.

Results: Overall, 320 parents completed the questionnaires before training, and 145 of them answered the questionnaire after training. The means and standard deviations (SD) of total knowledge were 7.54 and 3.79, respectively, before training, and increased to 15.95 and 2.61 after training, out of a maximum score of 19. Regarding fluoride, the mean and SD of knowledge before training were 4.22 and 2.13 (37.2% good knowledge), which increased to 7.53 and 1.36 (91% good knowledge) after training. Out of a maximum score of 9, the mean knowledge about fissure sealants was 3.32 (9.7% good knowledge) before training and increased to 8.44 and 1.58 (86.9% good knowledge) after training. Eventually, the mean attitude scores improved from 8.35 before training to 40.25.45 after training.

Conclusion: Due to the low knowledge of parents before education, it is necessary to consider methods to increase awareness about professional preventive methods. In addition, considering the positive impact of the received training, it seems that asking dentists to increase preventive education to their patients while providing services and involving the mass media in providing public education can be an effective measure.

Keywords: Awareness, Attitude, Fluoride therapy, Fissure sealant

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Background

Tooth decay is the most common disease among children (1) and is an infectious disease that can be detected in its early stages (2). Early caries in childhood cause pain, lack of growth, loss of self-confidence, and mental health problems (3). Tooth decay is prevalent in Iranian children. According to the report of the Ministry of Health, usually 75% of children aged 6–9 have tooth decay. This statistic shows the urgent need for basic interventions to reduce the burden of airborne tooth decay (4). Preventive

dental services can significantly reduce tooth decay. Raising the level of knowledge and attitudes of parents about preventive dental services can be important in encouraging them to ask for and use this type of service and the products of dentists (5). Exposure to fluoride plays an important role in preventing and reducing dental caries, so evidence indicates the effectiveness of adding fluoride to water and toothpaste (6). In recent years, the emphasis on caries protection by the systemic effect of fluoride has decreased significantly. A reanalysis of data from water fluoridation experiments supports the post-emergence effect of fluoride. It seems that the use of fluoridated water supplements during the growth period will protect teeth from decay to some extent, which is most likely to be a local effect. Fluoride has preventive effects on primary dental caries due to local contact with tooth enamel and through its antibacterial properties. Thus, the therapeutic use of fluoride in children should focus on regimens that maximize topical exposure, preferably in low-dose, high-repetition regimens. The use of caries preventive approaches, such as community water fluoridation, topical fluoride therapy, plaque control, and dietary sugar control, has been generally found to be the cause of the overall decline in caries prevalence, which in turn has had a greater effect on smooth surfaces (7).

Today, as a result of fluoride therapy along with correcting nutritional habits, improving the standard of living, and having more access to dental services, there is more power to deal with tooth decay, especially for children with a high risk of decay (8,9). However, the use of fluoride in protecting pits and deep occlusal grooves against caries is not as effective as smooth surfaces; this is contrary to the fact that more than 50% of all caries lesions occur in these grooves under the age of 20, and therefore the grooves are at higher risk of decay than smooth surfaces (10-12). Considering that caries among the pits and fissures have a higher percentage, the placement of fissure sealants by the dentist on the pits and fissures of the teeth with a higher risk of caries has a high effect on reducing the caries rate (12). Dental sealants have been developed to prevent caries in the grooves of the teeth surfaces. Sealants prevent the growth of bacteria that lead to tooth decay. Evidence shows that the fissure sealant is effective in preventing caries in children and adolescents. Their effectiveness may be related to the prevalence of caries in the population (13). Children's parents are the only people with whom children spend a lot of time. In addition, emotional relationships between parents and children increase the interaction between them. This interaction will be evident in various social, cultural, behavioral, and even health matters. According to the aforementioned cases, mothers are among the most influential people in the field of children's oral and dental health issues. Hence, the higher the level of knowledge and attitudes of mothers, the greater the impact. To increase mothers' knowledge about children's oral and dental health issues, the first step in determining the level of knowledge is their attitudes on this matter. The use of fissure sealants and fluoride therapy to prevent tooth decay in children is not an exception; thus, it seems necessary to investigate the level of knowledge and attitudes of students' parents (14). Lakshmanan and Gurunathan (15) found that parental knowledge and knowledge of preventive practices appear to support dental sealants as a preventive strategy for dental caries. However, most parents did not practice the preventive measures despite knowing their effectiveness and benefits. Greater efforts should be made to encourage the parents to provide their children with primary care. A statistically significant difference was noted in the knowledge and attitude scores at various age groups; nearly 71% of the participants agreed that pit and fissure sealants are effective in preventing dental caries. Only 34% of the study participants' children had received dental sealants. Deep et al (16) selected parents of children aged 7–12 years (N = 80). A validated and reliable questionnaire was designed, including a demographic section and questions about parent's knowledge and attitudes about fissure sealants and professional fluoride therapy. The required data were analyzed by the chi-square test. Based on their findings, the majority of the parents had a low level of knowledge about fissure sealants and fluoride therapy (68.8%). There was significantly higher knowledge and attitude in academically educated parents (30%). Parents from urban areas showed positive attitudes (27.5%). Taravati and Lak (17) evaluated parents' knowledge and attitudes about the importance of professional topical fluoride in preventing caries and its relationship with the mean decayed, missing, and filled primary teeth (DMFT) scores in children. They found that there was a direct, significant relationship between parents' attitudes and their educational level, age, and child's DMFT. Children's experience of professional topical fluoride was 18.6%. They concluded that parents' knowledge and attitudes toward the role of fluoride in the prevention of dental caries were low. Thus, it is suggested that related programs be written to increase parents' knowledge on using caries prevention techniques.

Based on the literature review and the identified gaps in prior studies, this research is essential for several reasons. It aims to enhance parental knowledge about preventive dental treatments, which can significantly reduce dental caries in children while improving public oral health. By identifying barriers, such as cost and lack of awareness, this study proposes applicable solutions for increasing parental acceptance of preventive care. Additionally, it provides insights into designing effective health programs in schools and informs supportive policies, including insurance coverage for treatments like fissure sealants, to expand access to essential dental services.

Objectives

The main goal of the project was to determine the impact of education on the knowledge and attitudes of parents of primary school children in Qazvin about fissure sealants

and fluoride therapy.

Methods

Study Design

This was a semi-experimental intervention (before-after) questionnaire-based study. The study population was parents of students studying in the first to sixth grades of primary school in Qazvin in the academic year 2020.

Sample Size and Sampling Methods

The city of Qazvin was divided into three geographical regions (north, central, and south). From each region, two schools were selected—one for girls and one for boys—resulting in a total of six schools. This approach represents a multistage cluster sampling method with proportional allocation. The number of participants selected from each school was determined based on the student population of that school to ensure proportional representation.

Data Collection Tools

Upon referring to the schools, a consent form with an explanation of how to implement the plan was sent to parents using virtual space applications. Parents were also assured about the confidentiality of the information.

Parents of first-grade to sixth-grade students who were literate and willing to participate in the study were included in this study. However, parents who did not complete the questionnaire for any reason after 4 weeks were excluded from the investigation.

After announcing the readiness of the parents, the questionnaire (see Supplementary file 1) was randomly distributed to the parents of the students in 6 classes online. Questions of the questionnaire were prepared based on the study of Tahani et al (18). Additionally, several other examples of different questionnaires have been referenced in sources (19–24). After completing the questionnaires, educational videos about fissure sealants and fluoride therapy were provided to the parents. To ensure that the parents have learnt about provided educational materials, a dental student who had already received the necessary training to answer the questions was introduced to the parents. After 4 weeks, parents' knowledge and attitudes were again measured with the online questionnaire that was placed on the site, and parents were asked to respond to the same questionnaire. Parents were excluded from the study if they failed to watch the training videos.

Ethical Considerations

Parental participation in this project, despite a request for participation and cooperation, was completely voluntary. They were also assured that the information and all responses provided by them would remain confidential.

Data Analysis

The sample size was calculated using a standard formula. A standard deviation (SD) of 20.24 and a difference of 2.24 were used, and the type I error (alpha) was set at 0.05. Based on these parameters, the estimated sample size was 320 participants (Figure 1). This calculation was based on the study by Azad et al (25), who also utilized an SD of 20.24 to estimate the awareness level.

After collecting the data from the questionnaires,

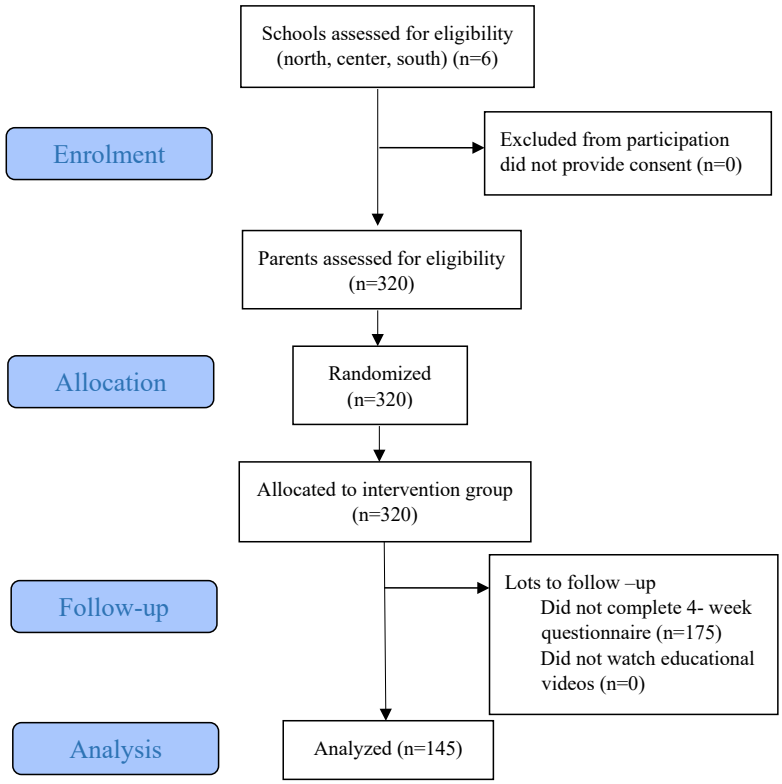

Figure 1. Consort Flow Diagram

the descriptive expression of the variables (means and frequencies) was discussed using the SPSS statistical software, version 21. One-way analysis of variance (examination of the relationship between knowledge and education level) was analyzed after checking the normality of the distribution of the quantitative variables (knowledge and attitude scores) with the Kolmogorov-Smirnov test using independent sample t-tests (examination of the relationship between knowledge and attitude before and after the intervention). In this study, the *P* value was considered less than 0.05.

Results

In this study, 320 parents completed the questionnaires before the training, while 145 parents completed them after the training (response rate: 45.3%). Among the post-training participants, 100 were girls (68.9%), and 45 were boys (31.03%). Most parents held a diploma (46.9%), while 28.3% had a bachelor's degree. Most parents were aged 35–45 years, with age ranges categorized as less than 30 years, 30–35 years, 35–45 years, and more than 45 years. Of the post-training respondents, 133 were mothers (91.7%), and 12 were fathers (8.3%).

The results indicated that the average total knowledge score improved significantly from 7.54 (Min. = 0, Max. = 18) out of 19 before training to 15.95 out of 19 after training. Similarly, the average knowledge about fluoride increased from 4.22 (Min. = 0, Max. = 8) out of 9 before training to 7.53 out of 9 after training. Knowledge about fissure sealants also improved, with scores rising from 3.32 (Min. = 0, Max. = 10) out of 10 before training to 8.44 out of 10 after training. Based on the conducted analysis, the 95% confidence interval ranged between -5.3 and -3.6.

The percentage of correct answers to individual knowledge questions is summarized in Table 1, demonstrating the significant impact of the training program on enhancing knowledge about fluoride and fissure sealants among parents.

Table 1 provides the data related to the increase in parents' knowledge about fluoride therapy and fissure sealants after training. For example, about 84% of parents knew the period when a child should not eat anything after fluoride therapy, and 88.3% of parents were aware of the use of fissure sealants in permanent teeth for adults. Before training, especially about fissure sealants, parents chose the "I don't know" option, which indicates their lack of familiarity. For example, in the field of fissure sealant, 77.9% had an idea that fissure sealant did not harden with a light cure device. In the field of fluoride therapy, 51% of parents did not know about the age of fluoride therapy, and 46.9% of parents did not know the number of useful times to perform fluoride therapy per year.

The findings highlight that the training program significantly enhanced parents' knowledge, as evidenced by the improvement in the mean (SD) of total knowledge scores from 7.54 (3.79) to 15.95 (2.61) and notable increases in awareness about fluoride therapy and fissure sealants. Before training, a majority of parents exhibited limited familiarity with key concepts, with many choosing the "I don't know" option, which underscores the need for educational interventions. Post-training, the high percentage of correct answers to specific knowledge

Table 1. Answers to the Knowledge Questions of the Questionnaire

Knowledge from	The percentage of People Who Answered Correctly		Number of Correct Answers		The Percentage of People Who Chose the "I Don't Know Option"	
	Before	After	Before	After	Before	After
Fluoride as a tooth-strengthening agent against caries	77.9	94.5	113	137	18.6	1.4
Fluoride as a reducer of caries-causing microbes	69.7	91	101	132	24.1	4.1
Lack of a need for anesthesia before fluoride therapy	53.8	85.5	78	124	40.7	13.1
Use of the fluoride gel only by a dentist	29	80	42	116	34.5	6.9
Use of a brush for fluoride therapy	65.5	87.6	95	127	31.7	9
Amount of time spent on fluoride therapy	37.2	73.1	54	106	40.7	13.1
The time that the child should not eat after fluoride therapy	13.8	84.1	20	122	15.9	3.4
Useful number of times to perform fluoride therapy per year	37.9	76.6	55	111	46.9	13.8
Age of fluoride therapy	37.2	77.9	54	113	51	6.9
The nature of fissure sealant material	31.7	83.4	46	121	53.1	15.2
Lack of needing anesthesia before applying fissure sealants	19.3	82.1	28	119	55.9	11.7
Lack of a need for tooth grinding in fissure sealants	37.2	86.9	54	126	52.4	12.4
Hardening of fissure sealant material with a light-curing device	18.6	77.9	27	113	77.9	17.2
Fissure sealant re-examination times	22.1	75.2	32	109	72.4	20.7
The preventive role of the fissure sealant	55.9	89.7	81	130	33.1	8.3
Use of fissure sealants even in adult permanent teeth	20	88.3	29	128	62.8	9
Fissure sealant as a barrier against the adhesion of microbes	57.2	93.1	83	135	31	2.8
The most important teeth to perform fissure sealants	45.5	86.9	66	126	42.8	2.1
Number of sessions required for the fissure sealant of one tooth	24.8	81.4	36	118	68.3	13.1

questions, such as the timing for fluoride therapy and the use of fissure sealants, suggests that training could effectively address gaps in understanding and positively impact oral health practices.

Figure 2 displays parents' attitudes toward various aspects of fissure sealant treatment in dental services. Therefore, about 44.1% before the training and 84.8% after the training disagreed that fissure sealant will damage the child's teeth. About 31.7% of parents before the training and 30% of them after the training agreed that the price of a fissure sealant is expensive compared to its benefits. Approximately 74.5% of parents before the training and 77.9% of them after the training believed that even with the fissure sealant, the child should brush his teeth. However, about 21.4% of parents before the training and 20% of them after the training thought that the tooth never decays by performing another fissure sealant.

Results of Analytical Statistics

The results of the one-way analysis of variance analysis demonstrated no significant difference between the mean

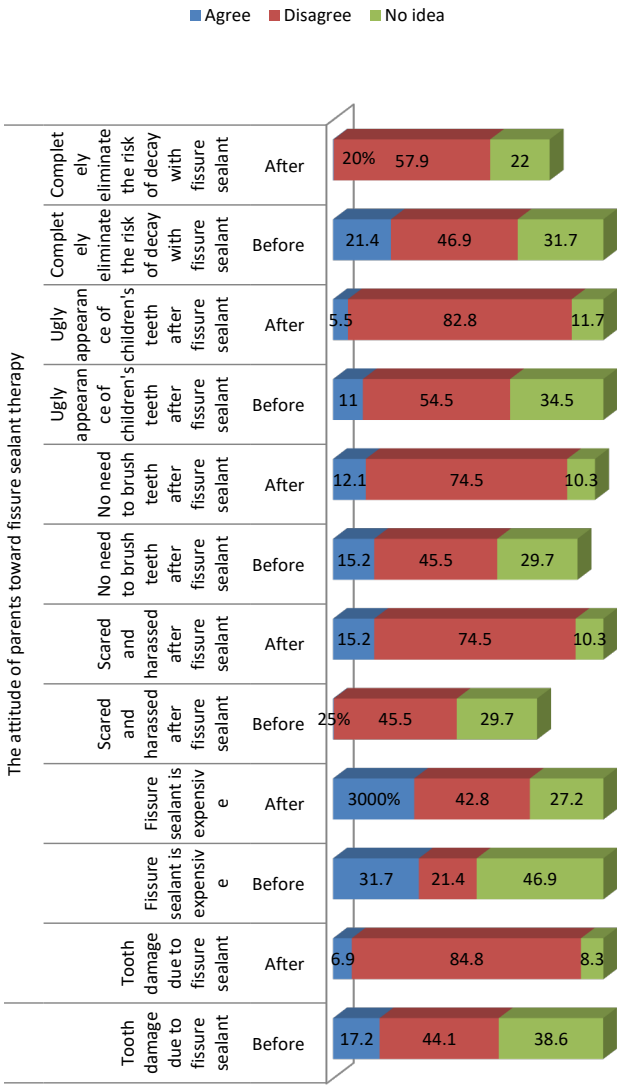

Figure 2. Attitudes of Parents Toward Different Aspects of Fissure Sealant Treatment in Dental Services

of total knowledge, fissure sealant and fluoride therapy, and total attitude before and after training with parents' age groups and education level. There was an acceptable relationship between the student's educational level and total knowledge before training and knowledge before training of the fissure sealant. In addition, a positive relationship was found between parents' gender and knowledge before fissure sealant training.

By recoding the attitude questions that were different from the others and summing the attitude scores (1 for agree to 3 for disagree), it was revealed that the average attitude scores (SD) were 35.80 (4.13) before training and 40.25 out of 45 (3.51) after training (Table 2). Higher scores indicated a positive attitude toward professional dental preventive treatments.

Based on the results, a significant correlation was observed in the scores of total knowledge and parents' attitude ($P<0.001$), and the correlation coefficient was calculated as 0.5. Therefore, people with higher knowledge had a more positive attitude toward dental preventive services. The t-test also confirmed the same point. The average knowledge after training (16.73) was significantly ($P<0.001$) higher in the group with positive attitudes than in the group with negative attitudes (13.48).

After examining the findings and studies presented in this paper, the strengths of the study can be summarized as follows:

1. Implementing school-based sealant therapy programs, in conjunction with fluoride treatments, significantly reduces the prevalence of dental caries among children.
2. Establishing practical fissure sealant programs in schools enhances parental knowledge regarding oral health and preventive care.
3. Educating parents plays a pivotal role in the prevention of dental caries in children by promoting effective oral hygiene practices.
4. Prioritizing education on the prevention of dental caries in children is essential for healthcare planners, as it supports the expansion of pediatric dental care services and improves overall oral health outcomes.

The limitations of this study stem from its timing during the coronavirus pandemic, which necessitated the use of remote methods for both training delivery and questionnaire completion. This restriction resulted in a reduced number of respondents compared to what might have been achieved with in-person participation.

Table 2. Comparing Parents' Attitudes and Knowledge Before and After Training

	Before	After	*P*-value
	Mean (SD)	Mean (SD)	
Attitude	35.8 (4.13)	40.25 (3.51)	0.001 <
Total knowledge	7.54 (3.79)	15.95 (2.61)	0.001 <
Fluoride knowledge	4.22 (2.13)	7.5 (1.36)	0.001 <
Knowledge of fissure sealant	3.32 (2.48)	11.12 (2.15)	0.001 <

SD, standard deviation.

Consequently, it is likely that conducting the training sessions in person would have enhanced engagement and effectiveness, yielding potentially stronger and more comprehensive outcomes.

Conclusion

The present study aimed to evaluate the impact of education on parents' knowledge and attitudes toward preventive oral health services provided professionally in service centers. The findings revealed that, prior to the training, the majority of parents demonstrated limited knowledge, particularly regarding fissure sealants, with only 37.2% aware of fluoride therapy and a mere 9.7% familiar with fissure sealants. However, after the training, knowledge levels improved significantly, with 86.9% of parents understanding fissure sealants and 91% becoming knowledgeable about fluoride therapy. These results underscore the effectiveness of educational interventions in enhancing parents' awareness and promoting preventive oral health practices. In the present study, before training, 37.2% of parents knew the appropriate age for fluoride therapy, which was in line with Tahani's study (18), while in Nakhjavani's study (19), this statistic was 50.4%, The observed difference may be explained by the educational information disseminated through schools, health educators, or media channels in Tehran. Of course, in the present study, after training, parents' knowledge reached 77.9%, showing the effect of education on increasing people's knowledge, which corroborates the findings of other studies (13,20-22). In the current research, about 55.9% of parents knew before training that fissure sealant was effective in preventing caries. It should be mentioned that about 10% of children (18) and in a study conducted in Saudi Arabia (20), nearly 9% of children had a history of fissure sealant, which is extremely low and indicates low performance and acceptance of parents toward preventive dental treatments. According to research (2,23), this can be due to the lack of parental knowledge, so it has been proven in these studies that the main reason for not referring to dentists for preventive measures is a lack of knowledge and sufficient training. Nonetheless, according to the results of the present study, 31.7% of parents before training and 30% of them after the training considered the use of fissure sealant expensive. Currently, the tariff for fissure sealant is slightly lower than single-level amalgam restorations. In general, nearly 82.1% of parents had a positive attitude toward professional preventive programs after the training, believing that the higher the knowledge, the more positive the attitude.

It should be noted that although parents had a positive attitude toward professional preventive programs after the training, they had low performance and acceptance toward preventive dental treatments since they believed that these preventive measures were expensive.

Strategic plans adopted by insurance companies to cover the cost of these effective treatments can encourage parents to a great extent (24). Meanwhile, school staff can simultaneously plan for silent therapy and the fluoride therapy program in order to reduce dental caries in children.

Overall, our findings revealed that education can be effective in increasing parents' knowledge and attitude toward preventive treatments.

Authors' Contribution

Conceptualization: Maryam Shokri Mozhdehi –Maryam Karimi Madani.
Data curation: Monirsadat Mirzadeh.
Formal analysis: Monirsadat Mirzadeh.
Investigation: Maryam Karimi Madani.
Methodology: Maryam Shokri Mozhdehi –Maryam Karimi Madani.
Project administration: Maryam Shokri Mozhdehi.
Software: Monirsadat Mirzadeh.
Supervision: Maryam Shokri Mozhdehi.
Validation: Maryam Shokri Mozhdehi- Maryam Karimi Madani.
Visualization: Maryam Karimi Madani- Mohammad Javad Khosraviani.
Writing–original draft: Mohammad Javad Khosraviani.
Writing–review & editing: Mohammad Javad Khosraviani.

Competing Interests

The authors declare that they have no competing interests regarding the publication of this article.

Data Availability Statement

The dataset presented in the study is available on request from the corresponding author during submission or after publication.

Ethical Approval

The Ethics Committee of Qazvin University of Medical Sciences approved the study (No. IR.QUMS.REC.1398.365).

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Informed Consent

Written informed consent was obtained from all participants.

Supplementary Files

Supplementary file 1 contains the designed questionnaire.

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