Iran J Psychiatry Behav Sci. 2021 March; 15(1):e102453. doi: 10.5812/ijpbs.102453.

Published online 2021 March 16. **Research Article**

The Effect of Pretreatment Conditioning by Mothers on Dental Behavior of Children: A Randomized Clinical Trial

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Received 2020 March 09; **Revised** 2021 January 26; **Accepted** 2021 February 05.

Abstract

Background: Behavior management techniques are an integral component of pediatrics dental visits.
Objectives: This study aimed to evaluate the effect of child pretreatment conditioning by mothers on the dental behavior of children during dental treatment.
Methods: Following a randomized clinical trial design, this study was conducted on 72 child-mother dyads, attending the pediatric dental department of Zahedan University of Medical Sciences (southeast of Iran). The children were 3 to 6 years old and required pulpotomy of one asymptomatic carious primary mandibular molar under inferior alveolar nerve block anesthesia. The dyads were randomly divided into control and intervention groups. Data on age and gender of children, mother's age, and parents' education were collected. Mothers in the intervention group received a brochure, containing information on how to prepare the child at home to better cope with the dental procedure. Those in the control group received no intervention. A one-month interval was set between the randomization and treatment. For both groups, an experienced pedodontist performed pulpotomy and stainless steel crown placement in a single session. The dental behavior of children during the operation was scored by a blind instructed and calibrated observer, using the Franckle behavior rating scale. Data were analyzed using the chi-square test, Fisher's exact test, and Mann-Whitney U test in SPSS version 20 at a significance level of 0.05.
Results: The child dental behavior in the intervention group was more frequently acceptable than their counterparts, and a significant difference was found between the groups ($P = 0.047$). The intervention was successful, regardless of the child's gender and age, mother's age, and parents' education ($P > 0.05$).
Conclusions: Based on the results, dental practitioners can promote child behavior by engaging mothers to prepare their children before dental procedures.

Keywords: Pediatric Dentistry, Mothers, Behavior

1. Background

Providing adequate oral health for children and enabling them to cope with dental services without any fear and anxiety are two major issues in pediatric dentistry. Accordingly, pedodontists apply communicative behavior management techniques during dental operations in order to improve behaviors (1, 2). Conscious sedation and general anesthesia are prescribed for young children who are not suitable candidates for in-office settings (3-5). However, sometimes parents do not allow providers to perform such modalities. Besides, in some cases, extensive treatment is not necessary (e.g., only a few restorations are needed). Therefore, the practitioner can decide to provide the child with an in-office treatment, which may be associated with disruptive behaviors that not only impede the treatment but also compromise the outcomes.

However, more attention should be directed towards the potential role of parents. Because of their continuous interaction with children, parents, especially mothers, can play a key role in preparing children for dental procedures. In other words, by informing children about their dental appointment and providing constructive feedback, parents can increase the child's competence. On the other hand, pedodontists need to provide mothers with appropriate information in order to guide them as dental co-therapists (6). Overall, parental empowerment may be an essential factor in increasing the child's self-perception of control during sessions, especially at earlier ages.

Parent's influence on their young children is well-established (7). Various studies have examined the child's behavior during dental treatments (3, 8, 9). However, studies on parental involvement have mainly focused on subjects such as improving weight adjustment (10, 11), promoting physical activity (12), and treating behavioral, emotional, and psychological disorders (13). To the best of our knowledge, there is only one study assessing the effect of parents' pretreatment education on child behavior during dental treatments. In the present study, carers of children in both control and intervention groups received a brochure on how to perform their child's oral hygiene and how to encourage their child to cooperate during operation, respectively. The child's dental behavior and carer's anxiety were recorded during and after the treatment. The intervention group showed improvements in child behavior during operation, compared to the control group. Also, carers of children in the intervention group were more relaxed than their counterparts in the control group. Hence, it was concluded that carers' pretreatment education not only may improve the child's dental behavior but also can decrease the carer's tension during routine dental procedures (14).

2. Objectives

Considering the importance of engaging mothers in preparing children for dental appointments, as well as the scarcity of relevant information, this study aimed to evaluate whether pretreatment behavioral conditioning provided by mothers can improve the child's dental behavior. The null hypothesis was no effect on the outcomes.

3. Methods

This randomized double-blind clinical trial was registered in the Iranian Registry of Clinical Trials (www.irct.ir) (IRCT201611066105N7). Besides, the study protocol was approved by the Ethics Committee of the Zahedan University of Medical Sciences (ZUMS), Zahedan, Iran (IR.ZAUMS.REC.1395.191).

3.1. Sampling and Inclusion Criteria

A total of 72 child-mother dyads refereeing to the Department of Pediatric Dentistry of ZUMS (Zahedan, Iran) from January to March 2017 were recruited. The inclusion criteria for the children were as follows: (1) age range of 3 - 6 years; (2) having completely healthy teeth, except for one asymptomatic carious primary mandibular molar, requiring pulpotomy under inferior alveolar nerve block anesthesia; (3) living with both parents, without siblings; (4) presenting to the dental setting for the first time; and (5) no history of familiarity with dentistry in various ways including mobile apps, computer software, cartoons, and stories before starting the study. The inclusion criteria for the mothers contained being Persian speakers, the age range of 20 - 40 years, and willingness to participate in the study.

On the other hand, the exclusion criteria were as follows: (1) ability to read and write; (2) having a child with a definitive diagnosis of physical, behavioral, emotional, communicative, or developmental disorders (according to the parents' report, history of frequent physician visits, or history of using certain medications for a long time); (3) having a child with a negative medical experience (e.g., history of dental trauma, an unfavorable diagnostic procedure, or exposure to medical interventions); and (4) having a child with presented uncooperative behavior during the clinical examination.

The sample size was estimated as 72 dyads, with a 90% statistical test power and type I error of 0.05, following a previous study (2). Overall, 97 (out of 115) consecutively attending dyads met the inclusion criteria. Participants were selected among these dyads using a table of random numbers (Figure 1).

3.2. Preparation of Participants and Group Assignment

All participating mothers signed a written informed consent form after the objectives of the study were fully explained to them. They were then asked to complete a demographic form, which included the child's age and gender, mother's age, and parents' education. The education level was defined as "low" ($\leq$ 12 years), "moderate" (13 - 15 years), and "high" ($\geq$ 16 years), according to the educational stage of the higher-educated parent. After examinations, topical fluoride therapy was applied for children. Afterward, they were randomly assigned to either control or intervention group, using a random allocation list. The groups were matched in terms of the child's gender and age. All children were then registered on a waitlist until dental treatment. Those in the control group received no intervention until the operation, which was scheduled for one month later.

3.3. Intervention

Mothers in the intervention group received a brochure on how to prepare the child to cope with the dental procedure; they were asked to implement the instructions at home. In addition, for assuring proper child preparation, one detailed individual explanatory session on the content of the intervention was held face-to-face for each mother at the office. The advantages of the intervention were also

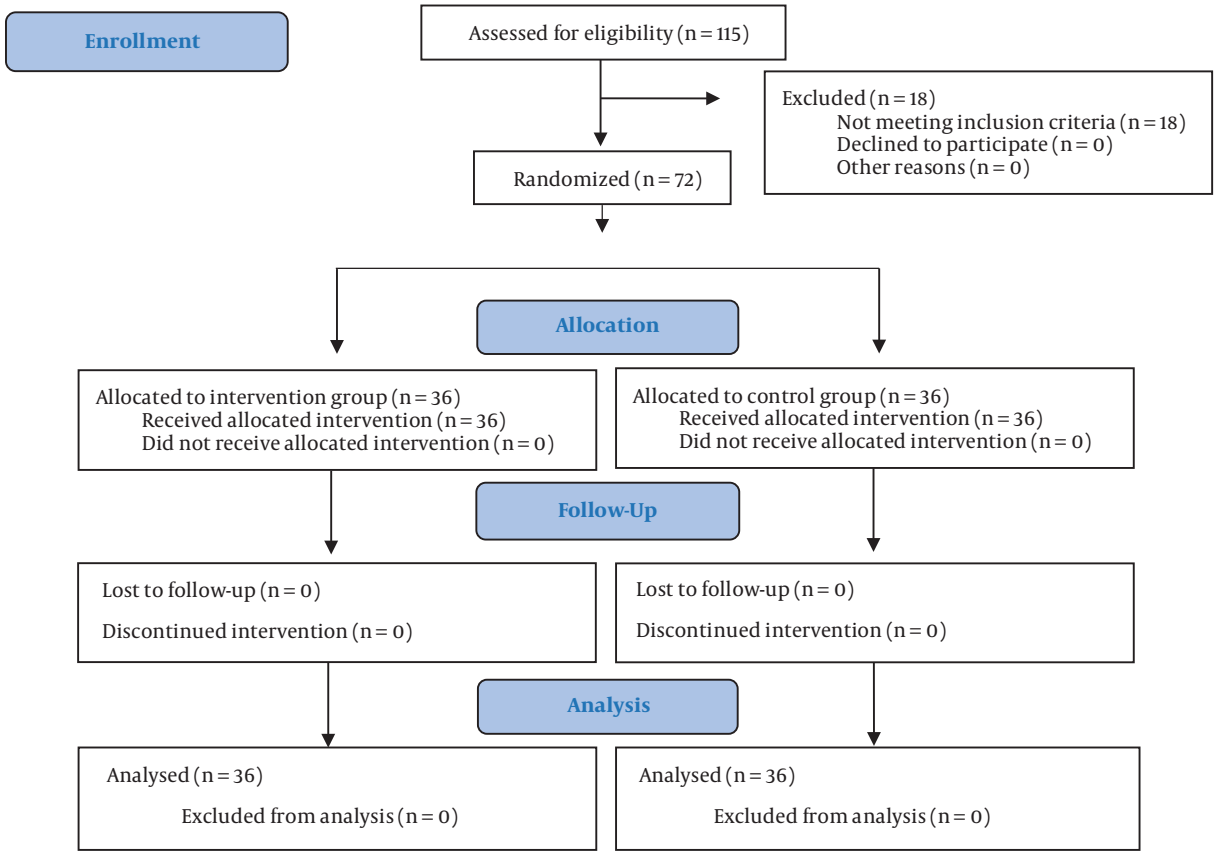

Figure 1. Participants' flow diagram

emphasized, including improvement of clinician-child interactions and declined parental strain during the dental operation. Also, we prepared the intervention material according to the pediatric dentistry texts, as well as current literature and clinical expertise of one of the researchers (as a provider). The initial brochure was sent to four pedodontists, and then necessary adaptations were applied after receiving constructive feedback. Thereafter, the validity of the brochure was evaluated. The items with content validity ratio and content validity index of > 0.62 and 0.79 remained in the form, respectively.

Subsequent to the introductory part of the brochure, and considering that mothers' engagement is necessary to achieve the best therapeutic outcomes, participating mothers were asked to tell their children a story related to a dental appointment at home (in a place without distraction). The main story character was a doll that needed dental treatment. Prior to the dental session (four times, once a week), mothers were required to tell a story to their children, inviting him/her to listen and describing slightly different scenarios. Simultaneously, they were asked to focus on the following parameters: Using an appropriate dialogue by uttering positive statements (e.g. "nice dentist"); Presenting the dentist as the authoritative figure, who speaks directly to the child, not through parents; Describing the parents as silent, but supportive individuals; Avoiding words and phrases, such as "do not be afraid of the dentist", "needles", "painless shot", and "no tears"; and applying the tell-show-do technique to introduce some instruments given to the mother (e.g. a dental suction tip and a bite opener).

All mothers were instructed by a skilled storyteller in three sessions. Then, they were asked to tell a story in order to assess their performance. On average, each story lasted for 10 minutes. Participants of the intervention group were asked to raise any possible questions through phone calls. This process was also used to assess their compliance with the study protocol. During phone calls, the supervisor asked mothers not to discuss the intervention content with other participating mothers in order to prevent information contamination of the intervention group. For the intervention group, a one-month interval was defined

between randomization and treatment, similar to the control group. Therefore, mothers had adequate time to prepare their children preoperatively.

3.4. Dental Treatment

During dental visits, pulpotomy and stainless steel crown placement under local anesthesia were performed by an experienced pedodontist. All children were accompanied by their mothers. The mother, while sitting next to the child, was asked not to speak as much as possible, without providing any input through her facial expressions or body language, so that children could focus their attention as much as possible on the practitioner. Based on the clinical judgment of the child's coping abilities, the practitioner adapted communicative behavior techniques during the appointments. If necessary, mothers, as well as fathers (when present), were actively involved for protective restraint; otherwise, they remained neutral. In the treatment sessions, mothers were asked to prevent information contamination between the two groups. We also ensured that mothers in the intervention group did not reveal any information to others and that participants of the control group did not receive any interventional information.

3.5. Blinding and Outcome Assessment

In the present study, children's dental behavior was defined as the main outcome. The child's behavior was examined at three different time points (i.e., during local anesthesia, middle of the treatment, and near the end of the treatment) by a blind assessor, who was well instructed, using Franckle behavior scale, which is a five-point Likert scale, ranging from 1 ("definitely negative") to 4 ("definitely positive") (Table 1). The assessor was trained by videos, demonstrating different child dental behaviors. Afterward, 20 videos, other than the previous ones, and ten live cases were used to calibrate the assessor. Four weeks later, the reliability of scoring was controlled by re-assessing the same 20 previous videos. For assessing and re-assessing, all videos were diagnosed correctly. In each case, the child was considered as either "uncooperative" (scores of 1 and 2) or "cooperative" (scores of 3 and 4). In addition, the overall child's dental behavior was determined as either "cooperative" or "uncooperative", according to the most common behavior. In the present study, the main practitioner was also blinded to the group assignments.

3.6. Study Supervision

One practitioner generated a random allocation sequence, enrolled the dyads, assigned them to the groups, and supervised and helped them if there was any question; she also trained the blinded investigator, who was instructed to score the child behavior.

3.7. Data Analysis

Chi-square test, Fisher's exact test, and Mann-Whitney U test were used for statistical analysis in SPSS version 20 for Windows at a significance level of 0.05.

4. Results

A total of 72 dyads (36 girls and 36 boys) were investigated in the present study. The mean age of children and mothers was 54.00 $\pm$ 11.23 months and 32.82 $\pm$ 7.32 years, respectively (Table 2). No significant difference was found between the groups regarding the mean age of mothers and children (P = 0.176 and P = 0.396, respectively). According to the results presented in Table 3, there was a significant difference in the overall child's dental behavior between the study groups (P = 0.047). The adjusted odds ratio of uncooperativeness was 2.54 in the control group versus the intervention group.

As shown in Table 4, there was no significant difference concerning the overall child's dental behavior between males and females both in the control and intervention groups (P = 0.253 and P = 0.500, respectively). Also, there was no significant difference in the overall child's dental behavior based on parents' education in the control group (P = 0.801). Besides, there was no significant difference concerning the overall child dental behavior in the intervention group, considering the integrated data on low and moderate levels of education (P = 0.185). Moreover, the results showed no significant difference in the overall child's dental behavior based on the child's age, as well as mother's age, in either of the groups (P > 0.05).

5. Discussion

According to the findings, the intervention could improve dental behavior. The associations between the overall child's dental behavior and the child's gender, parents' education, child's age, and mother's age were also analyzed. These variables were not statistically associated with better dental behavior in either of the groups.

Overall, the child's dental behavior plays a key role in providing adequate treatment (15). Different surveys have investigated the association between the child's dental behavior and variables like age, gender, maturity, family background (16, 17), emotional condition (2), unfavorable medical or dental history (15, 18, 19), personality traits (2, 15, 16), temperament (20-23), parents' dental fear and anxiety (15, 16, 19, 24-26), parental attitudes and perceptions (27), and parental rearing style (2, 22, 23, 28-30). The family atmosphere, where the child has been raised, also seems to affect the multidimensionality of his/her personality (2, 15,

Table 1. The Franckle Behavior Scale

Rating	Scoring	Description
1	Definitely negative	Pronounced refusal of the dental procedure, crying forcefully, being fearful, or any other overt evidence of extreme negativism.
2	Negative	Uncooperative, reluctant to accept treatment, and some evidence of negative attitude, but not pronounced.
3	Positive	Acceptance of treatment, at times cautious, willingness to comply with the dentist, at times with reservation, but patient follows the dentist's directions cooperatively.
4	Definitely positive	Good rapport with the dental practitioner and showing interest in the dental procedure.

Table 2. The Mean Age of Mothers and Children in the Groups [a]

Groups	Children (mo)	Mothers (y)
Control	54.94 ± 11.73	33.14 ± 7.27
Intervention	53.06 ± 10.78	32.50 ± 7.57

[a] Values are expressed as mean ± SD.

Table 3. Comparison of the Overall Child Dental Behavior between the Groups [a, b]

Groups	Uncooperative	Cooperative
Control	19 (52.8)	17 (47.2)
Intervention	11 (30.6)	25 (69.4)

[a] P = 0.047; Fisher's exact test.
[b] Values are expressed as No. (%).

29). It is known that parents, especially mothers, are the best individuals to accompany and guide children in coping with special circumstances, such as exposure to therapeutic interventions (30-32).

As documented in previous studies, the parental rearing style can affect the child's dental behavior (2, 28, 29). Likewise, the presence of parents in dental operatory is another influential factor (33). Overall, it can be concluded that interaction between the child, parents, and dentist is a highly influential factor, which determines whether the child can endure the treatment process (28). Despite numerous studies on dental anxiety, dental fear, and behavior management problems in children, few information is available on the effects of parental involvement on enabling children to behave well during treatments. In this regard, a previous Chinese study showed that parents of the education group, who received pamphlets, could prepare their children well enough for dental procedures (14).

To the best of our knowledge, this is the first English-language study addressing this issue. Moreover, previous studies on parental involvement in pediatric dentistry have been largely focused on assessing the effect of variables like parental presence during operation (34), parents' dental fear and anxiety (15, 24, 25), and child-rearing practice on child's behavior (2, 22, 23, 28-30). In the present study, the behavior was found to be significantly better in the intervention group than in the control group. The odd of expressing negative behavior in children who did not receive the intervention was 2.5 times higher than the controls. Behavior management problems, which are commonly scored by the Frankle behavior scale, are common in children aged 3 - 6 years. In the control group, the frequency of negative behavior was 52.8%, which is slightly higher than the rate (48%) reported by the study performed by Salem on a sample of Iranians. On the other hand, in the present study, in the intervention group, the frequency decreased to 30.6%.

The present study was conducted on a large representative sample of mother-child dyads living in the city of Zahedan (Iran). It worth noting that different characteristics of children and their mothers affect (21) the child's coping with the dental appointment. Nevertheless, we randomly divided the dyads into two groups in order to consider the effect of confounding factors. Also, we attempted to match the groups in terms of the child's age and gender to make them statistically comparable. Moreover, the comparability of groups was confirmed by statistical analysis, as no major difference was found in the mother's age.

Two circumstances may arise following such interventions. First, the child may feel the aversive aspects of treatment ahead, and s/he may receive messages encouraging competence to cope with the treatment (30); the first circumstance may result in a poor child's dental behavior. Meanwhile, providing the necessary information not only may allow the parents to manage the child efficiently for more cooperative dental behaviors but also can decrease the likelihood of negative perceptions. Based on the methodology of the present study, it can be concluded that our intervention was successful in encouraging better dental behavior. Based on the findings, the applied intervention might influence the child's behavior positively by increasing their ability to cope with the situation (e.g., exposure to strangers, instruments, noise, and vibration).

The child's gender may also affect the dental experience (4, 15, 21). The literature suggests that females exhibit negative behaviors more frequently than males in dental visits (4, 21); this difference may originate from biological characteristics (4). In contrast, some studies reported

Table 4. Comparison of the Overall Child Dental Behavior between the Groups According to the Child's Gender and Parents' Education [a]

Groups/Variables	Overall, Child Dental Behavior		P-Value
	Uncooperative	Cooperative	
Control			
Gender			
Female	8 (44.4)	10 (55.6)	0.253 [b]
Male	11 (61.1)	7 (38.9)	
Parents' education level			
Low	6 (54.54)	5 (45.45)	0.801 [c]
Moderate	6 (53.8)	6 (46.2)	
High	6 (46.2)	7 (53.8)	
Intervention			
Gender			
Female	5 (27.8)	13 (72.2)	0.500 [b]
Male	6 (33.3)	12 (66.7)	
Parents' education level			
Low	3 (23.1)	10 (76.9)	0.185 [b]
Moderate	3 (25.0)	9 (75.0)	
High	5 (45.5)	6 (54.5)	

[a] Values are expressed as No. (%) unless otherwise indicated.
[b] Fisher's exact test.
[c] Chi-square test.

no significant gender difference (15, 19). It worth noting that the majority of previous studies have collected data using a questionnaire, which might reflect the social and cultural acceptance of girls' fear (4, 21). Finally, considering the females' psychological maturity and perception, girls may perceive the dental situation as more unpleasant than boys (4, 21). However, misbehavior was slightly more common among males than females. In the present study, we found no association between gender and behavior, which contradicts the findings of some previous studies (4, 35) that reported a significant difference concerning the child's gender. On the other hand, Mishra et al. (15) reported similar results to our study; although the exact underlying mechanism is ambiguous, this finding is not surprising.

The effects of different aspects of psychological maturity, including cognitive skills, self-control, emotion regulation, and resulting ability to cope with the dental situation, at young ages have not yet fully developed. However, gender differences do not arise at these ages (4, 21, 28). There may also be no significant intragroup association between gender and behavior in the narrow age range of studied children. We believe that by studying older age children, there would be a higher chance of identifying gender-specific differences. In other words, the insignificancy of the association can be attributed to the narrow age range of children. Therefore, recruiting children with a wider age range in future studies would provide valuable information regarding the effect of age on coping strategies. Based on our findings, the child's gender and age are not clinically significant parameters in scheduling dental interventions.

Socioeconomic status (SES) is another important factor that may cause negative dental behavior (29). In several studies, SES has been used as a criterion of health behavior (15). Dental investigations have discussed the association between SES and the child's behavior (15). Numerous studies documented that children of low SES show unpleasant reactions (29). In contrast, Mishra et al. revealed no significant association (15). Several measures have been developed to determine SES, with most studies considered education as a component of SES (15). However, we could not investigate the actual SES of children, as we only evaluated the effect of education as a component of SES on behavior. In addition, in the intervention group, the frequency of different parents' education was not sufficient to perform statistical analysis. Inevitably, we merged the two groups of low and moderate education into one single

category. The lack of association between parents' education and child's behavior in each group can be attributed to the insufficiency of the small sample size to evaluate the impact of education in the study groups (whether merged or not).

Overall, the present study had some major strengths. It's well-proved that previous experience (s) of treatment is the most common cause of misbehavior (15, 21, 36). Indeed, some misbehaviors may be primarily due to some negative prior experience and fear of exposure to a similar situation (17, 19). Therefore, we excluded children with a history of treatment. According to the evidence, the complexity of treatment (15), oral health (17, 19, 21), and parental presence (34) can influence the child's response, as well. Also, environment and dental personnel may be influential. However, we tried to reduce the impact of these variables on the outcomes as much as possible.

Moreover, all mother-child dyads completed the survey. An experienced pedodontist performed all procedures, and routine behavior management techniques were used without any discrimination between the study groups. Single-parent families, having siblings, and the involvement of non-parents are probable confounders. Therefore, we recruited dyads in nuclear families to eliminate the effect of single-parent families and siblings and focused on the mother's role in conducting the intervention. In addition, in order to attribute merely the obtained outcome to the intervention and not to other issues including apps, cartoons, etc., children who were familiar with dentistry via such channels were excluded from the study. Finally, a blinded instructed and calibrated observer rated the children's behaviors to ensure the reliability and validity of data acquisition and to eliminate any potential bias.

Considering the limitations of this study, further research on different populations, with a more in-depth evaluation of various sociodemographic characteristics (e.g. SES, parenting style, and temperament) is suggested. In addition, by identifying more susceptible mother-child dyads and designing appropriate interventions for them, health care professionals can benefit from its advantages.

The intervention used in the present study was focused mainly on achieving the desired dental behavior. In addition, it is clear that the intervention is less resource-demanding and may decrease the need for sedation or general anesthesia. Finally, it can facilitate dental operation for children, their parents, and practitioner and is associated with increased quality and improved long-term prognosis of treatment.

5.1. Conclusion

In this study, we provided some preliminary evidence pertaining to the efficacy of the intervention in promoting positive child behavior when receiving dental procedures. No significant association was found between the child's dental behavior and the child's age or gender. Based on within-group comparisons, no significant difference was found concerning parental education. Overall, the dental professional treating child population can encourage mothers to prepare their children preoperatively for presenting positive dental behaviors, irrespective of the child's gender and age, mother's age, and parents' education.

Footnotes

Authors' Contribution: Nahid Ramazani, definition of the intellectual content, reviewing the literature, designating the study, treating the subjects, data analysis, and preparing the manuscript; Hedyeh Mohsenzadeh, randomization, subject supervision, data collection, and literature review. Finally, both authors critically reviewed and edited the manuscript.

Clinical Trial Registration Code: IRCT201611066105N7.

Conflict of Interests: There is no conflict of interest related to this manuscript.

Ethical Approval: IR.ZAUMS.REC.1395.191.

Funding/Support: Zahedan University of Medical Sciences funded the study.

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