



The Impact of Situation Simulation and Reflection Training on the Work Conscientiousness of Nursing Students: A Quasi-experimental Study

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Abstract

Background: Work conscientiousness refers to an ethical attitude towards assigned tasks. Teaching ethical principles and values using modern educational methods, such as situation simulation and reflection, can foster the sustainable learning of ethical issues among nursing students.

Objectives: This study aimed to compare the effectiveness of situation simulation and reflection training in improving the work conscientiousness of nursing students at Islamic Azad University in Golestan province.

Methods: This quasi-experimental study employed a pre-test-post-test design with a control group and included 75 nursing students (semesters 7 and 8) at the Islamic Azad University in Golestan province in 2023. Participants were selected through cluster sampling. To achieve this, three faculties from different regions in Golestan province were chosen by drawing lots. For randomization, sealed envelopes containing letters representing three groups—(X: The situation simulation group), (Y: The reflection group), and (O: The control group)—were used to assign group membership to the university branches: Situation simulation (Aliabadkatol Branch), reflection (Gonbadkavous Branch), and control (Azadshahr Branch). Subsequently, participants were selected using convenience sampling from students who met the inclusion criteria. The participants in the two intervention groups attended seven 30-minute sessions of either situation simulation or reflection training (once a week). In contrast, the participants in the control group did not receive any intervention. All participants in the three groups completed the Work Conscientiousness Scale from Costa and McCrae's (1992) NEO Personality Inventory both before and after the intervention. Data were analyzed using SPSS-24 software, applying independent samples *t*-tests, paired samples *t*-tests, chi-square tests, Fisher's exact tests, and analysis of covariance (ANCOVA) at a significance level of $P < 0.05$.

Results: The majority of participants in the three groups were female students aged 20 to 25 years. The mean conscientiousness scores before the intervention for students in the situation simulation, reflection, and control groups were 33.92 ± 6.53 , 36.88 ± 9.72 , and 36.96 ± 8.02 , respectively. The corresponding scores after the intervention were 50.96 ± 4.11 , 42.08 ± 5.88 , and 36.16 ± 8.6 , respectively, indicating a significant difference among the three groups in terms of conscientiousness ($P < 0.05$). The ANCOVA, after controlling for the pre-test effect, revealed a significant difference between the intervention and control groups ($P < 0.01$; $\eta^2 = 0.72$). This suggests that 72% of the post-intervention changes in conscientiousness were attributable to the impact of the situation simulation training interventions.

Conclusions: Both situation simulation and reflection interventions effectively improve the work conscientiousness of nursing students. However, as demonstrated in this study, the situation simulation intervention is more effective in enhancing work conscientiousness. Therefore, nursing managers, planners, and educators are encouraged to incorporate diverse training programs to promote moral values and enhance the work conscientiousness of nurses and nursing students.

Keywords: Situation Simulation, Reflection, Work Conscientiousness, Nursing Students

1. Background

Due to its nature and characteristics, nursing is considered an ethical profession (1). In addition to the knowledge and skills required for training healthcare staff, emphasis should be placed on the development and promotion of ethical values, attitudes, norms, social skills, and other attributes that shape human behavior (1, 2). One critical factor in training competent clinical nurses is the effective education of nursing students on ethical issues (3). Providing effective clinical education to prepare nursing students for diverse roles in various areas of healthcare services is among the most important objectives of universities of medical sciences (4).

A 2023 study revealed that 91.1% of students at the Islamic Azad University, Najafabad Branch, and 64.3% of students at the Islamic Azad University, Khorasgan Branch, Isfahan, exhibited a high level of work conscientiousness (5). Work conscientiousness is an internal trait that fosters discipline and commitment in nurses, enabling them to perform their duties effectively and deliver higher-quality care (6). Consequently, adherence to ethical standards and work conscientiousness in nursing enhances the quality of nursing services and significantly impacts the recovery process of patients (7).

Nurses' commitment to patients and their care is deeply rooted in values such as work conscientiousness and professional dedication, which are influenced by various psychological factors (8). Therefore, the nursing education system must facilitate the development of nurses' reasoning, critical thinking, open-mindedness, and sensitivity toward others (9). Effective learning is best achieved through methods that require active engagement, underscoring the importance of nursing professors employing modern teaching strategies to foster active learning (9,10).

Simulation is an active teaching method that replicates the real clinical environment and is designed to demonstrate processes using techniques such as role-playing and tools like educational videos and mannequins (11, 12). The primary reasons for employing simulation in nursing include the increasing number of nursing students, the limited availability of clinical situations, the emphasis on evidence-based practice, the development of nursing competencies, raising awareness, prioritizing patient safety, and the capacity of simulations to enhance clinical practice (13). Implementing simulation scenarios in specific

situations allows students to gain experience, develop skills in a safe environment, and acquire necessary competencies without the fear or anxiety of harming patients. Therefore, integrating situational simulations into the nursing education system promotes safe patient care, adherence to ethical principles, and improved patient outcomes (14,15).

Like situational simulation, reflection is an active learning method that effectively enhances awareness and skills in clinical settings (16). Reflection in education involves revisiting, reviewing, and recalling previously learned material to interpret or analyze it (17). Reflection plays a vital role in clinical education. Through reflective practice, learners draw on prior experiences and consider current circumstances to collect and analyze information. Constructive feedback from instructors further enhances students' abilities for self-regulation and self-assessment (18,19).

2. Objectives

Previous studies have emphasized the importance of active learning methods in nursing education to prepare students for addressing ethical issues. However, since few studies have specifically examined nursing students' work conscientiousness, the present study aimed to compare the effectiveness of situation simulation and reflection training in enhancing the work conscientiousness of nursing students at the Islamic Azad University in Golestan province in 2023.

3. Methods

This quasi-experimental study utilized a pre-test-post-test design and was conducted among undergraduate nursing students in the 7th and 8th semesters at the Islamic Azad University in Golestan province during the first semester of the 2023 - 2024 academic year. The study protocol was approved with the ethics code [IR.IAU.TON.REC.1402.098](#) by the Islamic Azad University, Aliabadkatul Branch, and was registered under the clinical trial code [IRCT20240219061050N1](#) in the Iranian Registry of Clinical Trials.

Based on a similar study by Fard et al. (20), and considering a type I error of 0.01 and a test power of 90%, the required sample size for this study was calculated as 23 participants per group using the sample size formula for interventional studies. To account for a potential 10% dropout rate, the final number of $n =$ participants in each group was set at 25, resulting in a total sample size of 75 participants.

$$n = \frac{\left(z_{1-\frac{\alpha}{2}} + z_{1-\beta}\right)^2 \left(s_1^2 + s_2^2\right)}{\left(\bar{x}_1 - \bar{x}_2\right)^2} = 23$$

The participants in this study were selected through cluster sampling. To do so, three faculties out of five nursing faculties in Golestan province were selected by drawing lots. For randomization, sealed envelopes containing letters representing three groups (X: The situation simulation group, Y: The reflection group, and O: The control group) were used to assign group membership at three university branches: The situation simulation group (Aliabadkatol Branch), the reflection group (Gonbadkavous Branch), and the control group (Azadshahr Branch). The number of students in the 7th and 8th semesters at the Aliabadkatol, Gonbadkavous, and Azadshahr branches were 50, 45, and 48, respectively. A total of 75 students were selected through convenience sampling and randomly assigned to the three groups, each consisting of 25 students.

The inclusion criteria were being a nursing student in the 7th or 8th semester, willingness to participate in the study, not having used modern educational methods, and not having failed the nursing ethics course. The exclusion criteria included being absent for more than one session, unwillingness to continue attending the training sessions, being an exchange student, or being transferred to another university.

Before conducting the interventions, a briefing session was held separately for students in each group at each faculty. First, the students were informed about the objectives of the study, the research procedure, the confidentiality of their data, and the fact that their participation or non-participation would not affect their academic evaluations. The participants were also given written and verbal assurances that they could withdraw from the study at any stage. Written informed consent was obtained from all participants before the interventions began. Additionally, the participants were assured that their involvement in the study would not incur any financial costs and that the researcher would be available to answer any questions or concerns they had during the intervention, with care and patience. Following this, a demographic information form (which assessed the participants' age, gender, nursing ethics course grade, and overall GPA) and Costa and McCrae's Work Conscientiousness Scale were completed by the participants in all three groups as a pretest.

The Work Conscientiousness Scale consists of 16 items from Costa and McCrae's (1992) NEO Personality Inventory. A total of 8 items (items 1 to 8) are related to

the dependability subscale (e.g., "I am a very competent and efficient person"), while the other 8 items (items 9 to 16) measure the achievement orientation subscale (e.g., "I work hard to achieve my goals"). The purpose of this questionnaire is to assess work conscientiousness from different dimensions. The items are scored on a five-point Likert Scale: Strongly agree (4), agree (3), undecided (2), disagree (1), and strongly disagree (0). The overall conscientiousness score is calculated by summing the scores of all items. The dependability subscale score is calculated by summing the scores for items 1 to 8, and the achievement subscale score is calculated by summing the scores for items 9 to 16. It should be noted that items 1, 2, 4, 6, 9, 11, and 13 are scored reversely. The minimum possible score on this scale is 0, and the maximum is 64. A score of 0 to 21 indicates weak conscientiousness, a score of 22 to 32 indicates moderate conscientiousness and a score of 33 to 64 indicates strong conscientiousness (21). Costa and McCrae's Work Conscientiousness Scale has also been used in numerous studies, and its face and content validity have been confirmed in most of them. The reliability of the scale was reported as 0.76 by Gatley-Irwinel and 0.72 by Ezhei et al. (as cited by Imani et al.) in an Iranian sample (21). In the present study, the reliability of the scale was calculated as 0.76 using Cronbach's alpha.

The participants in the situation simulation group watched a film on ethical challenges in nursing once a week for seven 30-minute sessions. The content of the films was approved by a group of experts and nursing professors. At the end of each session, the students were asked to complete a root cause analysis (RCA) form. Root cause analysis is the process of identifying the root causes of problems in order to find effective solutions for the same situation individually. The students in the reflection group also reviewed a written scenario of ethical issues similar to the films shown to the participants in the situation simulation group. After studying the scenario, they also completed a RCA form. Feedback was provided to the members of both groups by the researcher in each session. Table 1 shows the content of the intervention sessions. The students in the control group received no training intervention.

To prevent the exchange of information between students in the three groups, students from different faculties and cities were placed in separate groups. The students were unaware of their group assignments (control or intervention) based on their faculties and were instructed not to share information with other students. After completing the final training session, participants in all three groups were asked to complete

Table 1. Content of the Training Intervention Sessions

Sessions	Situation Simulation Groups	Reflection Groups	Duration
1	Missed care: A woman is hospitalized due to a complete burn on her right leg. She has asked the nurse several times since the beginning of the shift to help her change position, but each time the nurse was busy doing something else and the patient moved on the bed without help, enduring a lot of pain.	Missed care: A woman is hospitalized due to a complete burn on her right leg. She has asked the nurse several times since the beginning of the shift to help her change position, but each time the nurse was busy doing something else and the patient moved on the bed without help, enduring a lot of pain.	30 min
2	Confidentiality of information: A nurse is talking loudly to her colleague about her patient who has hepatitis, and another patient, who is a relative of the patient with hepatitis, hears this conversation and learns about his illness.	Confidentiality of information: A nurse is talking loudly to her colleague about her patient who has hepatitis, and another patient, who is a relative of the patient with hepatitis, hears this conversation and learns about his illness.	30 min
3	Failure to comply with government regulations or abortion laws: A woman has just found out that she is pregnant. She has been admitted to the hospital due to a cold and shortness of breath. Due to financial problems, she has decided to have an abortion and does not want to inform her husband; because she knows that he won't allow her to do so. Thus, she asks the nurse for advice on abortion, and the nurse introduces her to a center that performs illegal abortions.	Failure to comply with government regulations or abortion laws: A woman has just found out that she is pregnant. She has been admitted to the hospital due to a cold and shortness of breath. Due to financial problems, she has decided to have an abortion and does not want to inform her husband; because she knows that he won't allow her to do so. Thus, she asks the nurse for advice on abortion, and the nurse introduces her to a center that performs illegal abortions.	30 min
4	Medication administration errors: After injecting the medication, the nurse carelessly checks and records the patient's blood pressure. The patient complains of dizziness, headache, and lethargy. The nurse suspects a drug reaction and hypotension, and checks the blood pressure again, noticing the patient's hypotension.	Medication administration errors: After injecting the medication, the nurse carelessly checks and records the patient's blood pressure. The patient complains of dizziness, headache, and lethargy. The nurse suspects a drug reaction and hypotension, and checks the blood pressure again, noticing the patient's hypotension.	30 min
5	Euthanasia: A patient has just been diagnosed with colon cancer and doctors have told him that the cancer has metastasized and he will not live for more than 10 months. The patient asks the nurse for help in giving him a drug that will allow him to die painlessly and peacefully. The nurse tells him that it is illegal to do so in the hospital, but that he can do it himself by taking drugs.	Euthanasia: A patient has just been diagnosed with colon cancer and doctors have told him that the cancer has metastasized and he will not live for more than 10 months. The patient asks the nurse for help in giving him a drug that will allow him to die painlessly and peacefully. The nurse tells him that it is illegal to do so in the hospital, but that he can do it himself by taking drugs.	30 min
6	Incorrect preparation errors: The nurse is preparing the medication quickly due to being very busy, leaving the dissolved medication on the desk, and getting busy doing something else. Her colleague, who notices the medication, checks it and sees that the expiration date has passed and informs her colleague of it.	Incorrect preparation errors: The nurse is preparing the medication quickly due to being very busy, leaving the dissolved medication on the desk, and getting busy doing something else. Her colleague, who notices the medication, checks it and sees that the expiration date has passed and informs her colleague of it.	30 min
7	Nursing errors: A nurse is checking and recording the doctor's new orders into the card. She cannot read the name of a medication correctly and mistakenly records the same name and administers it to the patient. The next shift nurse, who is checking the doctor's orders, notices this error.	Nursing errors: A nurse is checking and recording the doctor's new orders into the card. She cannot read the name of a medication correctly and mistakenly records the same name and administers it to the patient. The next shift nurse, who is checking the doctor's orders, notices this error.	30 min

the items on the Work Conscientiousness Scale again. To comply with ethical protocols and ensure that no group was deprived of a beneficial intervention, participants in the control group were provided with the content of the intervention programs. Additionally, the content of the training interventions for the two intervention groups was shared between both groups.

The collected data were statistically analyzed using SPSS 24 software at a significance level of less than 0.05 ($P < 0.05$). The Shapiro-Wilk test was initially used to examine the normal distribution of the data. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were used to summarize the data. Furthermore, inferential statistics, including the independent samples *t*-test, paired samples *t*-test, chi-square test, Fisher's exact test, and analysis of variance (ANOVA), were employed for analysis.

4. Results

The majority of students in all three groups were female and aged between 20 and 25 years. Other demographic characteristics of the participants are

presented in Table 2. The mean scores of conscientiousness before the intervention for the students in the situation simulation, reflection, and control groups were 33.92 ± 6.53 , 36.88 ± 9.72 , and 36.96 ± 8.02 , respectively. The corresponding values after the intervention were 50.96 ± 4.11 , 42.08 ± 5.88 , and 36.16 ± 8.6 , respectively, showing a significant difference between the three groups in terms of conscientiousness ($P < 0.05$).

The ANOVA test showed no significant difference between the three groups in terms of work conscientiousness before the intervention ($P = 0.34$). However, the ANOVA test revealed a significant difference between the three groups in terms of work conscientiousness after the intervention ($P = 0.01$). Furthermore, the paired samples *t*-test demonstrated a significant difference between both the situation simulation and reflection groups in terms of work conscientiousness before and after the intervention ($P = 0.01$). No significant difference was observed in the mean scores of work conscientiousness for students in the control group before and after the intervention ($P = 0.92$) (Table 3).

Table 2. The Demographic Characteristics of the Participants in the Three Groups^a

Variables and Categories	Groups			P-Value
	Situation Simulation	Reflection	Control	
Age (y)				0.14 ^b
20 - 25	13 (52)	24 (96)	23 (92)	
25 - 30	8 (32)	1 (4)	2 (8)	
> 30	4 (16)	0 (0)	0 (0)	
Gender				0.08 ^c
Female	21 (84)	12 (48)	20 (80)	
Male	4 (16)	13 (52)	5 (20)	
Marital status				0.08 ^b
Single	16 (64)	22 (88)	14 (56)	
Married	9 (36)	3 (12)	10 (40)	
Divorced/widow	0 (0)	0 (0)	1 (4)	
Grade on the ethics course (out of 20)				0.54 ^b
19 - 20	4 (16)	9 (36)	8 (32)	
18 - 19	7 (28)	7 (28)	10 (40)	
17 - 18	7 (28)	4 (16)	4 (16)	
16 - 17	6 (24)	5 (20)	2 (8)	
< 16	1 (4)	0 (0)	1 (4)	

^a Values are expressed as No. (%).^b Chi-square test.^c Fisher's exact test.**Table 3.** Descriptive Statistics for Work Conscientiousness of the Participants in the Three Groups Before and After the Intervention^a

Groups	Pre-intervention Phase	Post-intervention Phase	P-Value ^b
Situation simulation	33.92 ± 6.53	50.96 ± 4.11	0.01
Reflection	36.88 ± 9.72	42.08 ± 5.88	0.01
Control	36.96 ± 8.02	36.16 ± 8.6	0.92
P-value ^c	0.34	0.01	-

^a Values are expressed as mean ± SD.^b Paired samples *t*-test.^c Independent samples *t*-test.

The analysis of covariance (ANCOVA), which adjusted for the pre-test effect, showed a significant difference between the intervention and control groups ($P < 0.01$; $\eta^2 = 0.72$). This implies that 72% of the post-intervention changes in conscientiousness can be attributed to the impact of the situation simulation training interventions (Table 4).

5. Discussion

This study compared the effects of situation simulation and reflection training interventions on the work conscientiousness of nursing students at the

Islamic Azad University in Golestan province. The findings indicated no significant difference in conscientiousness among the three groups in the pre-intervention phase, while the ANOVA showed a significant difference between the groups after the intervention. Furthermore, a statistically significant difference was observed between the situation simulation and reflection groups in terms of conscientiousness before and after the intervention. However, no significant difference was observed in work conscientiousness for the participants in the control group before and after the intervention. Accordingly, the findings suggested that both situation simulation

Table 4. The Impact of Situation Simulation Training on the Conscientiousness of Nursing Students

Source of Variance	Sum of Squares	df	Mean Squares	F	P-Value	η
Modified model	3265.44	2	721632	67.53	< 0.01	0.74
Pre-test	1132.61	1	815.42	46.84	< 0.01	0.49
Group	2953.18	1	2953.18	122.13	< 0.01	0.72
Error	1136.47	47	24.18	-	-	-
Sum	101026	50	-	-	-	-
Total	4401.92	49	-	-	-	-

and reflection methods positively impacted the work conscientiousness of nursing students, but situation simulation was more effective in promoting this personality trait. These findings emphasize the importance of using active learning methods in nursing education, as such methods not only improve clinical skills but also enhance students' behavioral and ethical characteristics.

Situation simulation engages students in the active learning process by creating environments that mimic real situations. Previous studies have also shown that simulation has a positive effect on conscientiousness, decision-making skills, and reduced performance anxiety. For instance, Lavoie et al. demonstrated that simulation not only increases students' self-confidence but also strengthens their sense of responsibility and their ability to face real-world challenges (22). Moreover, implementing simulated scenarios in safe educational environments enables nursing students to develop their skills and acquire the necessary competence to provide safe care without the concern of harming the patient (23).

Reflection has also been recognized as an effective educational approach for improving conscientiousness and professional skills. In a study by Kim et al., the participants in the intervention group received training on reflection and were then encouraged to use this process during patient care. After one month, they found a statistically significant difference between the intervention and control groups in terms of conscientiousness and communication competence, highlighting the importance of incorporating reflection into clinical work (24). These findings confirm that reflection helps students learn from their experiences and strengthens the connection between theory and practice. Conscientiousness, as the cornerstone of ethics, is a deeply individual and subjective way of applying values and anti-values. It specifies the boundary between right and wrong and, as an outcome of work ethics, influences the decision-making process. People with high levels of conscientiousness tend to

work harder. Therefore, conscientiousness is a key prerequisite for providing quality, standardized care and ensuring long-term productivity.

In their quasi-experimental study, Abedini et al. examined the effect of reflection in clinical education from the perspective of nursing students and found that reflection improved competence and self-confidence (25). Additionally, Dehghany et al. studied and confirmed the effect of reflection on the clinical competencies of nursing students (26). Thus, using reflection as an educational strategy in clinical skills development can enhance the clinical competencies of students.

In a quasi-experimental study, Seneysel Bachari et al. investigated the effect of family nursing education using the reflection method combined with situation simulation through video screening on the learning and perspectives of nursing students. The findings showed that the reflection method had a greater impact on practical and effective learning, enhanced job recognition, increased opportunities for effective feedback from professors, reduced errors in real-world settings, improved recognition of families in crisis and vulnerable families, and facilitated conducting home visits with respect to legal and cultural issues. The results also indicated that developing and implementing a family nursing training program through reflection improved students' learning and perspectives. By using situation simulation with the help of film screening, students' understanding of the conditions of vulnerable families was enhanced. Students gained a deeper perspective on family problems, which could increase their ability and responsibility to address family-oriented issues in the future (27). Furthermore, Parchami et al. conducted a randomized controlled trial to compare the effects of written simulation and computer simulation of a virtual patient on the development of moral sensitivity in intensive care unit nurses. The results showed that both written simulation and computer simulation of a

virtual patient were effective in developing the moral sensitivity of ICU nurses (28).

Overall, the findings from the present study can be explained through Kolb's experiential learning theory (Kolb, 1984), which emphasizes the importance of practical experience and reflection in learning (29). In the simulation method, students face real challenges through direct experience and use feedback to improve their performance. In the reflection method, analyzing past experiences helps students gain a deeper understanding of professional situations and establish a more effective connection between theory and practice.

Implementing simulated scenarios in specific situations allows students to gain experience, develop their skills, and acquire the necessary competence without fear and anxiety (caused by the potential harm to the patient). As a result, using this method in nursing promotes safe care and desirable outcomes for patients (30).

5.1. Conclusions

The data from this study revealed that both situation simulation and reflection interventions can be effective educational methods for promoting the work conscientiousness of nursing students. These interventions, in addition to developing technical skills, also enhance the moral and behavioral characteristics of students. Educational experts currently emphasize the use of modern, active, and inclusive methods because traditional university education methods often focus primarily on the professor's lecture, with students primarily watching and listening. Although learning through lectures is inevitable and even effective in certain situations, such as delivering basic information, this method usually does not provide enough opportunities for learners' active thinking and participation, which are essential for deep learning. Given the findings of this study and the importance of active educational methods, situation simulation, and reflection interventions—or a combination of both—can be incorporated into modern learning approaches in nursing education programs. These intervention techniques not only enhance students' skills and ethical characteristics but can also play an effective role in promoting safer care and achieving more favorable patient outcomes.

One of the strengths of this study was the use of a quasi-experimental design with intervention and control groups, which allowed for the evaluation and comparison of the effectiveness of both situation simulation and reflection. The research team sought to

reduce errors, biases, and confounding factors by following established guidance for conducting well-known experimental and quasi-experimental studies and aimed to achieve more reliable findings by carefully executing the research procedures.

One of the limitations of this study was that the participants were selected from a specific university (Islamic Azad University in Golestan province), which may limit the generalizability of the findings to other universities or educational settings. Additionally, this study only examined the short-term effects of the situational simulation and reflection interventions and did not evaluate their long-term effects on students' work conscientiousness.

Given the development of nursing tasks across various educational, managerial, research, and healthcare areas, the findings of this study can contribute to the development of research programs aimed at implementing situation simulation and reflection interventions to enhance nursing management and care. Considering the strengths and limitations of the present study, future research could explore the long-term effectiveness of these interventions and their retention effects in diverse educational settings.

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Footnotes

Authors' Contribution: Z. M.: Drafting the manuscript; N. H.: Scientific advisor; R. N. P.: Statistical advisor.

Clinical Trial Registration Code: The clinical trial registration code is [IRCT20240219061050N1](https://www.clinicaltrials.gov/ct2/show/study?term=IRCT20240219061050N1).

Conflict of Interests Statement: The authors declared no conflicts of interest.

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

Ethical Approval: This study was conducted as part of the requirements for a master's thesis in pediatric nursing at Islamic Azad University, Aliabadkatul Branch, with the code of ethics [IR.IAU.TON.REC.1402.098](https://www.iautn.ir/REC.1402.098).

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Informed Consent: Written informed consent was obtained from all participants before the interventions began.

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