

The effect of evidence-based nursing education on nurses' clinical decision making: A randomized controlled trial

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Abstract

Introduction: Nurses are the largest group of health-care providers and their clinical decisions have an essential role in patients' clinical condition. Evidence-based nursing has been proposed as a health-care method based on the latest findings and evidence. Therefore, we aimed to determine the effect of evidence-based nursing education on dialysis nurses' clinical decision-making.

Material and Methods: This single-blind experimental study conducted in 2021 at dialysis wards of teaching hospitals affiliated to Urmia University of Medical Sciences. In this study, a total of 60 dialysis nurses were recruited using convenience sampling and allocated to two groups of intervention ($n = 30$) and control ($n = 30$). Data were collected at three time points of before, 1 week after, and 1 month after the intervention using a demographic questionnaire and the Lauri and Salantera Clinical Decision-Making Questionnaire (LSCD-MQ). Nurses in the intervention group received 12 sessions of evidence-based nursing education, while nurses in the control group received no intervention.

Results: The results showed the mean score of clinical decision-making had a significant decreasing trend over time ($p < 0.001$) so that it decreased significantly 1 week after the intervention (72.83 ± 4.90) compared with before the intervention (69.5 ± 67.34) in the intervention group. Moreover, participants' decision-making moved toward analytical decision-making. The results also indicated there was a significant difference between the baseline mean score of clinical decision-making and the postintervention mean scores obtained 1 week ($p = 0.025$) and 1 month ($p = 0.001$) after the intervention. However, this difference was not found to be significant in the control group ($p = 1.000$).

Conclusions: The study results indicate the positive effect of evidence-based education on nurses' clinical decision-making. Therefore, nurses are recommended to apply evidence-based education methods to improve their level of clinical decision-making. Health officials are also recommended to hold in-service evidence-based workshops to update nurses' knowledge.

KEYWORDS

clinical decision-making, clinical trial, education, evidence-based, hemodialysis, nurses

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1 | INTRODUCTION

Nurses are the largest group of health-care providers and spend far more time with patients than other health staff, so their decisions have a vital role in the treatment process of patients.¹ Clinical decision-making is a process of critical thinking in selecting the best practice to achieve the desired result and is raised when several treatment options can be performed for the patient. Clinical decision-making is a complex activity that requires nurses' knowledge about nursing science, access to resources, dynamic information, and a supportive environment.² The stages of clinical decision-making are similar to the stages of the nursing process as it begins with reviewing and gathering information about the problem and ends with evaluation.³ Given the responsibilities and scope of nursing practice and the need for correct decision-making in the nursing care process, nurses must acquire the ability to analyze critical clinical situations and make life-saving decisions in complex circumstances.⁴ The most important benefits of correct and timely decision-making in nursing include speeding up patients' treatment process, providing higher levels of patient care, reducing treatment costs, facilitating the proper use of health workforce and medical equipment, and improving the quality of care.⁵ On the other hand, the lack of timely and correct decision-making in nursing endangers public health.⁶ According to the results of a study in this area, nurses' wrong clinical decisions are the leading cause of about 34% of medical complications in the United Kingdom hospitals, of which 6% goes to permanent disability and 8% goes to patient death. It should also be noted that half of these deaths could be prevented by timely decisions of nurses.⁷

Practical nursing care requires the acquisition of problem-solving skills and the use of research in clinical decision-making.⁸ In the process of evidence-based education, nurses learn how to work collaboratively in solution-seeking groups. Nursing professors have also recognized evidence-based education as a complementary approach, which can be utilized along with conventional and teacher-centered education methods.⁹ Based on the latest findings, evidence-based nursing has been proposed as a method for providing health care.¹⁰ Nurses should be able to make independent decisions and achieving this goal can be facilitated by using research evidence in clinical care.¹¹ Despite that the nursing profession has begun to shift its paradigm toward evidence-based practice and that some studies have been conducted in this regard, the concept of evidence-based education and its related factors have never been examined. For instance, in a study on nurses' views on the quality of evidence-based education, more than 46% of nurses have reported the quality of education to be at poor to moderate levels.¹² Moreover, it was found that only 38% of nursing care services are provided based on research.¹³ Therefore, considering the importance of this issue and the limited number of studies in this area, this study was conducted to determine the effect of evidence-based nursing education on dialysis nurses' clinical decision-making.

2 | MATERIALS AND METHODS

2.1 | Study design & setting

This is a single-blind randomized controlled trial conducted in 2021 at the hemodialysis wards of Imam Khomeini and Taleghani Hospitals, Urmia, Iran.

2.2 | Participants and sample size

The sample size was calculated based on the independent-samples *t* test using G*Power software.¹⁴ Based on the study by Nouhi et al. (2014), the results of which showed the mean score ± Standard Deviation (SD) of 86.94 ± 9.92 and 80.46 ± 8.55 for the intervention and the control groups, respectively, and considering the confidence interval and test power of 95%, the minimum sample size for each group has to be 84 using the following formula.

$$n = \frac{\left(z1 - \frac{\alpha}{2} + z2 - \beta\right)(s1^2 + s2^2)}{\mu1 - \mu2}$$

Nonetheless, regarding the limited size of the target population (there were only a number of 65 dialysis nurses), the minimum sample size for each group was calculated to be 47 using the following population correction factor. Furthermore, considering the probability of 25% sample attrition, the final sample size for each group was considered to be 30.

$$n = \frac{n}{1 + \frac{n}{N}}$$

2.3 | Inclusion and exclusion criteria

Inclusion criteria consisted of the followings: (a) willingness to participate in the study, (b) having a bachelor's degree or higher, (c) having at least 1 year of work experience, and (d) working in the hemodialysis ward. Exclusion criteria consisted of the followings: (a) unwillingness to continue participation in the study, (b) being absent from more than one training session, and (c) filling in the questionnaires incompletely.

2.4 | Data collection

Data were collected using a demographic questionnaire and the Lauri and Salanterä Clinical Decision-Making Questionnaire (LSCD-MQ).

The demographic questionnaire included items on age, gender, marital status, educational status, and work experience in hemodialysis wards.

The LSCD-MQ was first developed by Lauri and Salanterä to evaluate nurses' decision-making ability. This tool consists of 24 items on clinical decisions and is scored on a 5-points Likert-type scale from "Always = 5" to "Never = 1". Accordingly, the overall score of this tool

ranges from 24 to 120. The scores below 68 indicate analytical (first level) decision-making, the scores of 68–78 indicate intuitive-analytical (second level) decision-making, and the score above 78 indicates intuitive (third level) decision-making. This tool has been developed based on four stages of the decision-making process, including (a) data collection, (b) information review and problem identification, (c) planning and implementation, and (d) follow-up and evaluation.¹⁵ The Persian version of this tool is available and has been used in several studies conducted in Iran. In Iran, Moghaddam et al. confirmed the content validity of this tool using a panel of experts. They also confirmed the tool's reliability using the internal consistency method, based on which Cronbach's α coefficient of the tool was calculated to be 0.80.¹⁶ In another study, Cronbach's α of this tool was obtained to be 0.85.¹⁷

2.5 | Ethical considerations

Before the beginning of the study, the study protocol was approved by the Research Ethics Committee of Urmia University of Medical Sciences (Ethics No. IR.UMSU. REC.1398.407). This study has also been registered on the Iranian Registry of Clinical Trials (Registration No. IRCT201611160300926N6). After providing necessary explanations of the study objectives, written informed consent was obtained from all participants. They were also informed that their participation in the study is on a voluntary basis and they are free to withdraw from the study anytime. Furthermore, they were assured of the confidentiality and anonymity of personal information.

2.6 | Intervention

After obtaining permission from the officials of Imam Khomeini and Taleghani Hospitals, sampling was begun. The target population was made up of all nurses working in hemodialysis wards of Imam Khomeini and Taleghani Hospitals, Urmia, Iran. First, a list of nurses who had met the inclusion criteria ($N = 65$) was prepared and then a total of 60 nurses were randomly selected from it. In cases where a nurse was not eager to participate in the study, another one was randomly selected and replaced to participate in the study (Figure 1). After completion of the sampling, samples were randomly divided into two groups of intervention and control using a random number table. Moreover, nurses in the intervention group were randomly divided into five groups of six individuals and then studied the principles of evidence-based education through interactive dialogue and this finally led the quality of education to be improved.

Nurses in the intervention subgroups received twelve 60-min sessions of theoretical and practical evidence-based education (two sessions a week), while no education was provided for the nurses in the control group. The educational intervention was performed in classes equipped with online computers so that an educational scenario was first prepared and then presented using a problem-solving-based approach (Table 1). The educational content consisted of materials on searching for nursing resources, identifying the

correct resources and evidence, searching in various paper-based and electronic resources, selecting and evaluating accurate resources, and applying the research results.

Nurses in the intervention group were also trained on how to search databases. Then The PICO (Population, Intervention, Control, and Outcomes) format was utilized to formulate questions.

Population/Patient: What is the patient's problem? Intervention/Index: What is the main treatment? Comparator/Controller: Is there any alternative to the treatment? Result: What is the main result? Is it what the patient desires?

The LSCD-MQ was recompleted 1 week and 1 month after the intervention by the nurses in both groups. After completion of the study, the content of the training sessions was provided for the nurses in the control group in the format of compact discs and if they wished, the very same training sessions would be held for them.

2.7 | Data analysis

All data analysis processes were conducted using the IBM SPSS Statistics for Windows, version 22.0 (IBM Corp.). The Shapiro–Wilk test was utilized to determine the normality of data distribution. In the descriptive statistics section, measures of frequency and percentage were used to describe qualitative data, and measures of mean and Standard Deviation (SD) were used to describe normal quantitative data. In the inferential statistics section, the χ^2 and Fisher's exact tests were used to examine the homogeneity between the groups and the repeated measures analysis of variance (rANOVA) was used to make in-group comparisons. A p -value of less than 0.05 was considered significant for all statistical tests. Moreover, a researcher who was blind to the data performed data analysis.

3 | RESULTS

3.1 | Demographic characteristics

Based on the results of this study, the mean age of participants in the control and the intervention group was shown to be 31.83 ± 6.73 and 31.53 ± 6.65 years, respectively. Moreover, the mean work experience of participants in the control and the intervention groups was indicated to be 5.71 ± 5.36 and 6.08 ± 5.09 years, respectively. The results of the χ^2 test showed that there was no significant difference between the two groups in terms of gender, marital status, and educational status ($p > 0.05$). In other words, both groups were homogeneous in terms of demographic characteristics (Table 2).

3.2 | Clinical decision-making

The results of the Shapiro–Wilk test showed that the scores of clinical decision-making have a normal distribution at all measurement time points ($p < 0.05$) (Table 3).

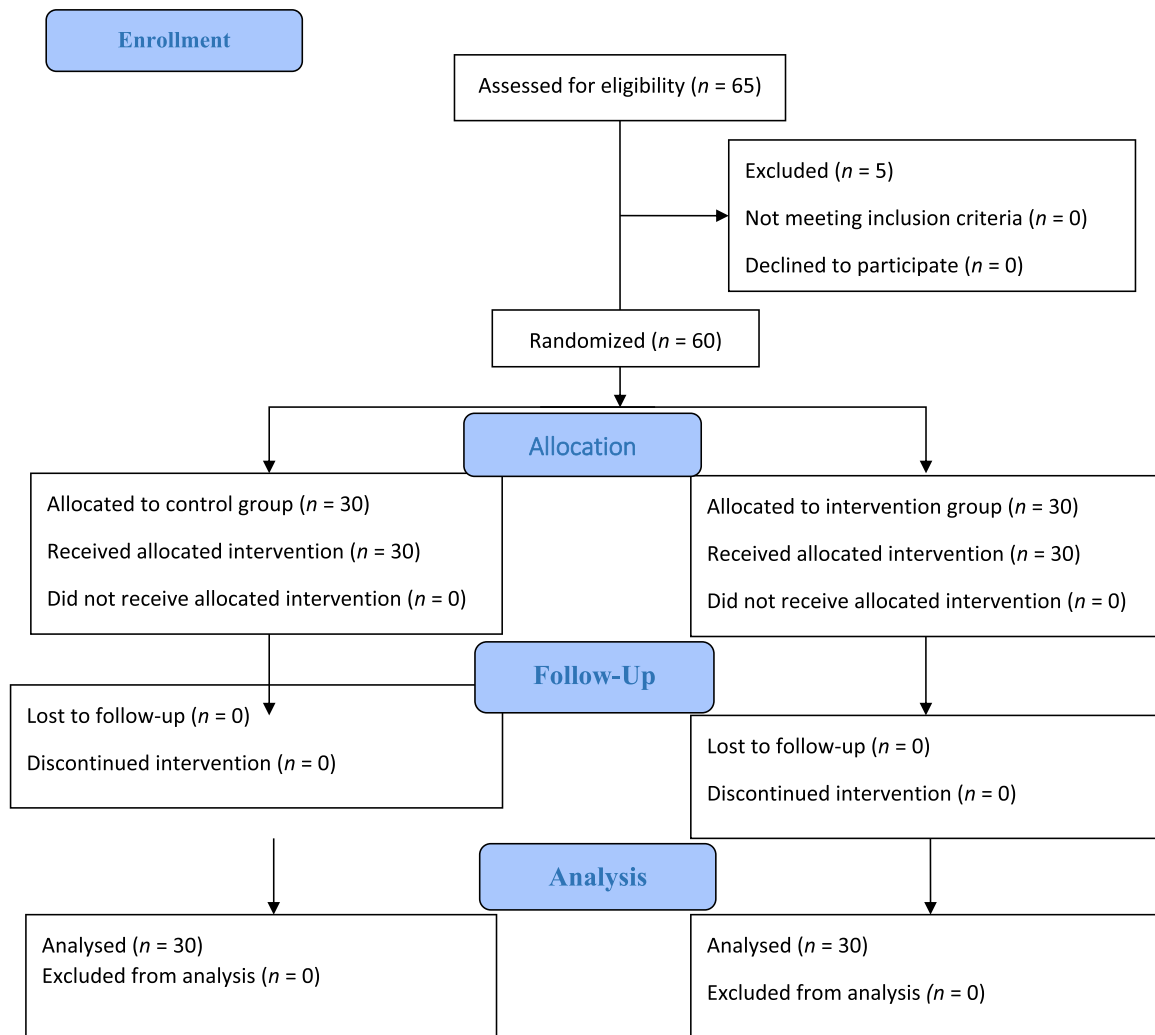


FIGURE 1 Research flow diagram based on Consort 2010 statement

In the intervention group, the mean scores of clinical decision-making at time points of before, 1 week after, and 1 month after the intervention were shown to be 72.83 ± 4.90 , 69.67 ± 5.34 , and 67.10 ± 5.39 , respectively. Nonetheless, in the control group, the very same mean scores were found to be 72.73 ± 6.12 , 72.60 ± 4.04 , and 72.73 ± 5.22 , respectively (Table 4). The results of rANOVA indicated that there was a significant difference in the mean score of clinical decision-making between the two groups after the intervention ($p < 0.05$) (Table 5).

3.3 | Binary comparisons

In the intervention group, the results of binary comparisons based on Bonferroni test showed that both postintervention (1 week and 1 month after the intervention) mean scores of clinical decision-making were significantly different from the baseline mean score ($p < 0.05$). However, no significant difference was found between the two postintervention mean scores of clinical decision-making in this group

($p = 0.062$). In the control group, no significant difference was found between the baseline and the postintervention mean scores of clinical decision-making ($p = 1.000$). There was also no significant difference between the two postintervention mean scores of clinical decision-making (Table 6).

4 | DISCUSSION

The present study was conducted to investigate the effect of evidence-based nursing education on clinical decision-making in dialysis nurses working at teaching hospitals affiliated to Urmia University of Medical Sciences. The results showed that the control and intervention groups were homogenous in terms of demographic characteristics. It was also shown that the mean score of the dependent variable significantly increased in the intervention groups after the provision of evidence-based nursing education. In other words, this method of education has been indicated to have a positive impact on dialysis nurses' clinical decision-making. In other

TABLE 1 Content of the sessions of evidence-based education

| Session no. | Content |
|-----------------------------------|--|
| 1st week (1st and 2nd session) | Introducing oneself to participants, familiarizing group members with each other and research objectives, providing general information about the intervention program (specifying time, place, and length of educational sessions), explaining the rules and regulations, filling in the questionnaires, taking a pretraining scenario-based test, defining and explaining the evidence-based education, and posing some questions for discussion |
| 2nd week (3rd and 4th session) | Familiarizing group members with the use of evidence-based education and its impact on clinical decision-making |
| 3rd week (5th and 6th session) | Reviewing the content of the previous session, reviewing the articles, familiarizing group members with different sections of an article and different types of intervening variables, and reviewing several hemodialysis-associated articles |
| 4th week (7th and 8th sessions) | Reviewing the content of the previous session, educating the PICO format, getting acquainted with various databases and the way to search for articles in each of them, changing and rewriting the clinical problem in the form of searchable and answerable questions, and getting to know the meaning of operators "AND" and "OR" when searching in databases |
| 5th week (9th and 10th sessions) | Reviewing the content of the previous session, providing a scenario and finding the answer to the scenario based on the most up-to-date evidence, practicing and repeating the answers with members, and educating how to find the best evidence in the shortest time |
| 6th week (11th and 12th Sessions) | Reviewing the content of the previous session, designing a clear clinical question based on the patient's problem, finding the answer to the question by searching databases, practicing and evaluating group members to ensure they are learning appropriately, reconducting the scenario-based test after the completion of the intervention, summarizing the whole content, and acknowledging the group members |

Abbreviation: PICO, Population, Intervention, Control, and Outcomes.

TABLE 2 Comparison of quantitative and qualitative demographic characteristics between the two groups

| Qualitative variables | | Control | | Intervention | | Results of the χ^2 test |
|------------------------|---------|------------------|------------|------------------|------------|--|
| | | Frequency | Percentage | Frequency | Percentage | |
| Gender | Female | 23 | 76.67 | 26 | 86.67 | $\chi^2 = 0.001$ $df = 1$ p -value = 1.000 |
| | Male | 7 | 23.33 | 4 | 13.33 | |
| Marital status | Married | 21 | 70 | 22 | 73.33 | $\chi^2 = 0.084$ $df = 1$ p -value = 0.772 |
| | Single | 9 | 30 | 8 | 26.67 | |
| Quantitative variables | | Mean \pm SD | | Mean \pm SD | | Results of the independent-samples t test |
| Age | | 31.83 \pm 6.73 | | 31.53 \pm 6.65 | | $t = 0.174$ $df = 58$ p -value = 0.863 |
| Work experience | | 5.71 \pm 5.36 | | 6.08 \pm 5.09 | | $t = -0.271$ $df = 58$ p -value = 0.787 |

TABLE 3 Results of Shapiro-Wilk test about the normality of clinical decision-making mean scores

| Mean scores of clinical decision-making | | t | df | p -value |
|---|--------------|------|------|------------|
| Before the intervention | Control | 0.93 | 30 | 0.065 |
| | Intervention | 0.94 | 30 | 0.09 |
| One week after the intervention | Control | 0.93 | 30 | 0.06 |
| | Intervention | 0.96 | 30 | 0.34 |
| One month after the intervention | Control | 0.98 | 30 | 0.88 |
| | Intervention | 0.94 | 30 | 0.07 |

TABLE 4 Mean scores of clinical decision-making in the control and intervention groups at measurement time points of before, 1 week after, and 1 month after the intervention

| Mean scores of clinical decision-making | | Frequency | Mean | SD |
|---|--------------|-----------|-------|------|
| Before the intervention | Control | 30 | 72.73 | 6.12 |
| | Intervention | 30 | 72.83 | 4.90 |
| One week after the intervention | Control | 30 | 72.60 | 4.04 |
| | Intervention | 30 | 69.67 | 5.34 |
| One month after the intervention | Control | 30 | 72.73 | 5.22 |
| | Intervention | 30 | 67.10 | 5.39 |

TABLE 5 Comparison of participants' clinical decision-making scores between the two groups at three measurement time points based on the repeated measures ANOVA

| Overall mean scores of clinical decision-making | RSS | df | MSE | F | p-value | η^2 |
|---|----------|--------|--------|-------|---------|----------|
| Main effect of time | 248.41 | 1.78 | 139.89 | 8.25 | 0.001 | 0.125 |
| Group \times time interaction effect | 246.81 | 1.78 | 138.99 | 8.201 | 0.001 | 0.124 |
| Error term (time) | 1745.44 | 102.99 | 16.95 | - | - | - |
| Main effect of intervention | 358.42 | 1 | 358.42 | 6.99 | 0.010 | 0.108 |
| Error term (intervention) | 2971.022 | 58 | 51.23 | - | - | - |

Abbreviations: ANOVA, analysis of variance; MSE, mean squared error; RSS, residual sum of squares; η^2 , partial eta squared.

TABLE 6 Binary comparisons of participants' clinical decision-making scores at three measurement time points based on the Bonferroni test

| Group | Measurement time point | MD | SE | p-value | Confidence interval | |
|--------------|---|--------|------|---------|---------------------|-------------|
| | | | | | lower bound | upper bound |
| Control | Before and 1 week after the intervention | 0.133 | 0.69 | 1.000 | -1.63 | 1.90 |
| | Before and 1 month after the intervention | <0.001 | 0.96 | 1.000 | -2.43 | 2.43 |
| | One week and 1 month after the intervention | -0.133 | 0.68 | 1.000 | -1.87 | 1.60 |
| Intervention | Before and 1 week after the intervention | 3.17 | 1.11 | 0.025 | 0.322 | 6.01 |
| | Before and 1 month after the intervention | 5.73 | 1.34 | 0.001 | 2.32 | 9.13 |
| | One week and 1 month after the intervention | 2.57 | 1.05 | 0.062 | -0.102 | 5.23 |

Abbreviations: MD, mean difference; SE, standard error.

words, this educational approach has improved nurses' level of clinical decision-making.

Nouhi et al. (2014) conducted a quasi-experimental study about the effect of evidence-based nursing education on nurses' level of clinical decision-making. In line with the results of our study, they showed that holding evidence-based training workshops promoted the level of participants' clinical decision-making.¹⁷ In a study about the effect of evidence-based clinical scenarios on the complications of blood transfusion in hemodialysis patients, Abdelwahab et al. (2013) reported no side effects during a blood transfusion after the intervention. One of the goals of nursing care is to reduce the complications experienced by patients and evidence-based practice leads us to achieve this goal. Developing a standard approach and testing it based on an evidence-based practice model is the first step in generating evidence needed for optimizing results.¹⁸

In a descriptive study by Camargo et al. about the impact of evidence-based methods of nursing education on attitude, level of motivation, and ability to understand research among nurse leaders, it was indicated that holding evidence-based workshops offers information on better access to the care provided by nurse leaders.¹⁹ Madarshahian et al.²⁰ also conducted a quasi-experimental study to determine the effect of evidence-based clinical education on the quality of clinical patient care. They concluded that evidence-based education in nursing care is not only as effective as traditional education but promotes knowledge, skills, and quality of patient care.²⁰ Based on the findings of a quasi-experimental study by Laine et al. about the effect of evidence-based patient education on

schizophrenia patients' understanding of their disease, it was revealed that the use of the website in evidence-based patient education could better improve schizophrenia patients' self-efficacy compared with conventional methods.²¹ Parker et al. also showed that nursing education could shift nurses' decision-making from intuitive to analytical. They also concluded that nurses who use analytical decision-making act faster than other nurses. Moreover, they reported that analytical decision-making reduces the rate of patient deaths in hospitals.²² The results of the above studies were all consistent with the results of our study.

4.1 | Study limitations

The COVID-19 pandemic negatively affected the course of the study, so that many participants were concerned about getting coronavirus disease. To prevent the spread of COVID-19, participants received the intervention in small groups and were emphasized to observe all health protocols during the study course. Regarding the limited numbers of dialysis nurses, the study sample size was small and this could restrict the generalizability of the study results. The educational content was derived from different data resources, which could affect the educational process. Moreover, participants had different talents for learning, which could affect the study results. To increase the validity of the study results, researchers are suggested to conduct studies with larger sample sizes and different follow-up time points.

5 | CONCLUSION

Based upon the findings of this study, we concluded that evidence-based nursing education effectively improves nurses' clinical decision-making and can lead health system managers to take important steps in this regard. Health-care managers are also recommended to run in-service evidence-based training courses for updating nurses' information. Therefore, evidence-based nursing education should be in the center of attention and applied to train nurses in a way that they would be able to make the right decisions in complex medical conditions and use these skills to improve professionalism and patient satisfaction as well.

AUTHOR CONTRIBUTIONS

Parisa Ghodsi Astan: Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; supervision; writing – original draft; writing – review & editing. **Rasoul Goli:** Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; software; supervision; validation; visualization. **Masumeh Hemmati Maslakkpak:** Resources; supervision; writing – review & editing. **Javad Rasouli:** Data curation; investigation; resources; validation; visualization. **Leyla Alilu:** Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; software; supervision; validation; visualization; writing – review & editing.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

All the relevant data are in the manuscript. The data that support the findings of this study are available from the corresponding author upon reasonable request.

TRANSPARENCY STATEMENT

The lead author Leyla Alilu affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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