

# Comparison of the effect of multisensory stimulation intervention and aromatherapy inhalation with lavender essence on anxiety and depression in the older adults undergoing hemodialysis

Ehteram Sadat Ilali<sup>1</sup>, Zohreh Taraghi<sup>2</sup>, Azar Jafari-Koulaee<sup>3</sup>, Forouzan Elyasi<sup>4</sup>, Mahmood Moosazadeh<sup>5</sup>

<sup>1</sup>Department of Geriatric Nursing, School of Nursing and Midwifery, Mazandaran University of Medical Sciences, <sup>2</sup>Department of Geriatric Nursing, Health Sciences Research Center, Addiction Institute, Mazandaran University of Medical Sciences, <sup>3</sup>Student Research Committee, Mazandaran University of Medical Sciences, <sup>4</sup>Department of Psychiatry, Sexual and Reproductive Health Research Center, Psychiatry and Behavioral Sciences Research Center, School of Medicine, Addiction Institute, Mazandaran University of Medical Sciences, Sari, <sup>5</sup>Health Science Research Center, Mazandaran University of Medical Sciences, Sari, Mazandaran, Iran

## ORCID

Ehteram Sadat Ilali: 0000-0002-7283-7358;  
Azar Jafari-Koulaee: 0000-0002-5463-3562;

## Abstract

**Context:** Effective management of anxiety and depression in older adults undergoing dialysis is essential because of unpleasant consequences.

**Aims:** This study aimed to comparison the effect of multisensory stimulation intervention and lavender aromatherapy on anxiety and depression in the older adults undergoing hemodialysis.

**Setting and Design:** This was an interventional study with two groups with pre and posttest plan (IRCTID: IRCT20170611034454N4).

**Materials and Methods:** This study was conducted on 48 patients in Sari in 2020 that were randomly divided into multisensory stimulation and aromatherapy groups. Anxiety and depression were measured by geriatric anxiety inventory and geriatric depression scale. Patients received interventions 3 days of a week for 4 weeks.

**Statistical Analysis Used:** Data were analyzed using SPSS v.21. Mann–Whitney U test was used to compare the anxiety and depression, as divided by the time intervals to before and after the intervention between two groups. Friedman test was utilized to compare the anxiety and depression over the various measurement times in each group.

**Results:** Significance difference were found in each group in terms of anxiety and depression reduction during various measurement times ( $P < 0.001$ ). There was a significant difference between two groups in terms of depression one week after the end of the intervention ( $P = 0.03$ ).

**Conclusion:** According to the results, it seems that multisensory stimulation intervention and aromatherapy can be useful for improving the anxiety and depression but multisensory stimulation was more effective to improve depression.

**Keywords:** Anxiety, Aromatherapy, Depression, Multisensory stimulation, Older adult

**Address for correspondence:** Miss. Azar Jafari-Koulaee, Mazandaran University of Medical Sciences, Sari, Mazandaran, Iran.

E-mail: jafaria241@gmail.com

**Received:** 10 August 2020, **Accepted:** 13 October 2020, **Published:** 19 July 2021

Access this article online	
Quick Response Code:	Website: www.jnmsjournal.org
	DOI: 10.4103/JNMS.JNMS_105_20

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**How to cite this article:** Ilali ES, Taraghi Z, Jafari-Koulaee A, Elyasi F, Moosazadeh M. Comparison of the effect of multisensory stimulation intervention and aromatherapy inhalation with lavender essence on anxiety and depression in the older adults undergoing hemodialysis. *J Nurs Midwifery Sci* 2021;8:155-62.

## INTRODUCTION

Older adults undergoing hemodialysis are more susceptible toward mental health disorders such as anxiety and depression compared to other patients due to some factors such as loneliness, less ability of working, damage to social support, dependence, and losing friends or relatives.<sup>[1-3]</sup> It seems that they have weaker and less management and coping strategies compared to youth.<sup>[4,5]</sup> Furthermore, such disorders can be accompanied by therapeutic costs, function disorders, not following therapeutic actions and even suicide, which would affect individual's self-care issue and the results of therapies as well as life quality.<sup>[4]</sup> Therefore, paying attention to the challenges and mental health needs of such older people is very important to achieve successful aging and a desirable quality of life.

In this regard, various studies have pointed to the positive effect of some of nonpharmacological strategies such as art therapy,<sup>[5]</sup> music therapy,<sup>[6-8]</sup> and aromatherapy<sup>[9,10]</sup> to improve of depression and anxiety. Regarding aromatherapy, some of the studies have reported the positive effect of inhalation aromatherapy with lavender essence on reducing anxiety and depression and some other studies' results indicated its ineffectiveness on reducing anxiety and depression.<sup>[11-13]</sup> Therefore, it seems that due to the existing oppositions, more researches are needed to be conducted in this regard. Multisensory stimulation intervention is among rehabilitation treatments that can reduce sensory deprivation dangers and facilitate the improvement of various responses and anxiety, depression, and memory.<sup>[14,15]</sup> Multisensory stimulation intervention awakens reticular activating system of the mind and leads to the improvement of processes related to the mind. In healthy axons, lateral relations entitled lateral shoots are created due to the effect of these stimulations that help to the re-organization of mental activities.<sup>[16]</sup> Multisensory stimulations can include using pleasant smells, positive visual stimulations such as pictures, touching, and soft music.<sup>[17]</sup> During the review of the literature, it was revealed that various studies have indicated the effectiveness of mentioned stimulus (olfaction, visual, and auditory) in the form of multisensory stimulations on reducing anxiety and depression of older adults with Alzheimer<sup>[15]</sup> and older adults of nursing home.<sup>[14]</sup> In the present study, multi-sensory stimulation intervention was applied on the older adult population undergoing hemodialysis treatment, this was quite different than the population of the mentioned researches. In addition, the comparison of multisensory stimulation intervention and aromatherapy is based on a similar study<sup>[18]</sup> to determine whether multisensory stimulation (olfaction, visual, and auditory) can have more favorable effects on anxiety

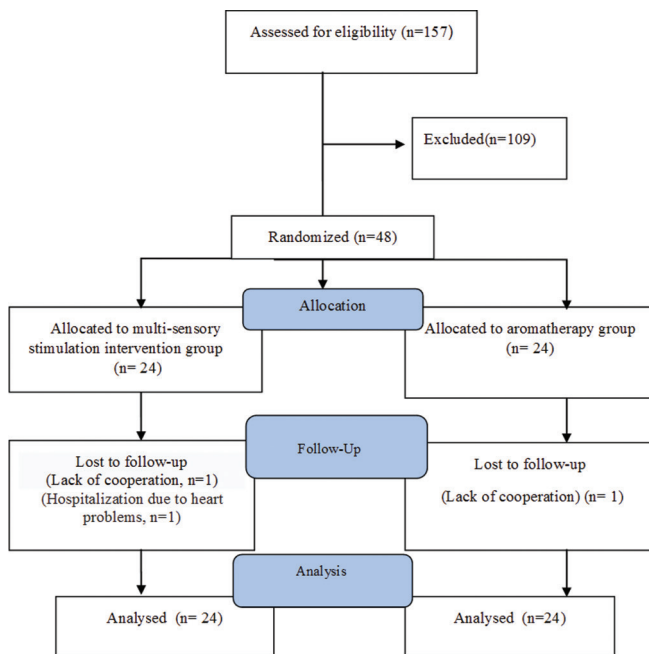
and depression than stimulation of one sense (olfaction) and whether there is superiority between these two nonpharmacological interventions. Otherwise, if the effects of stimulating one sense are similar to stimulating several senses, then stimulating one sense can be more cost-effective. Therefore, due to the mentioned reasons and not conducting such a study on the older adults undergoing hemodialysis despite the fact that most of the dialysis patients are older adults, the present study was conducted with the aim of comparing the effect of multisensory stimulation intervention and inhalation aromatherapy with lavender oil essence on the anxiety and depression in the older adult undergoing hemodialysis.

## MATERIALS AND METHODS

This research methodology was an interventional study with two groups with pre and posttest plan. This study was conducted on the older adults undergoing hemodialysis refereeing to the Shahrvand comprehensive kidney care center in Sari city in 2020. Sample size was calculated to include 24 individuals in each group based on Moghaddasifar *et al.*'s study,<sup>[14]</sup> having the depression mean and standard deviation of  $(8.3 \pm 14.7)$  (control group) and  $(5.3 \pm 10.1)$  (interventional group) after the intervention, and confidence level of 95%, power of 90% and using the comparison formula among means in G-power software. Having information regarding the method of administering the study and its purposes and having obtained the written consent form patients meeting the inclusion criteria, and assuring them than data would remain confidential, sampling was done. First, individuals were included in the study conveniently based on inclusion criteria of the research, then they were randomly divided into two groups of multi-sensory stimulations and inhalation aromatherapy. Details are provided in Figure 1. Samples were allocated to two groups using block sampling method. Blocking was done using random allocation software and 12 blocks of 4 pairs were produced by the software; then, samples having the inclusion criteria were allocated into multisensory stimulation group or inhalation aromatherapy group.

### Inclusion and exclusion criteria

The study's inclusion criteria consisted of having the age of 60 years and more,<sup>[19]</sup> being consciousness and capable of verbal and visual communication,<sup>[20]</sup> having a normal cognitive status based on the abbreviated mental test (AMT) (having the score of 7 or more), mild to moderate anxiety,<sup>[10-16]</sup> mild to moderate depression,<sup>[15-11]</sup> having hemodialysis experience for at least 6 months and 3 sessions of hemodialysis in a week,<sup>[21]</sup> having healthy hearing, visual, and olfactory sensations and not being sensitive to lavender



**Figure 1:** The CONSORT flow diagram. Note: According to the explanations in the method section, 24 participations in each group were analyzed with intention to treat approach

essence, not using alcohol, narcotics or psychotherapy medicine, not experiencing any event that may increase the mental pressures of the individual (the death of spouse or other members of the family, divorce, severe disease, and other unpleasant events during the past 6 months)<sup>[21]</sup> and not participating simultaneously in anxiety and depression reduction classes or not taking counseling courses and not meeting any psychologists or psychotherapists. The health of hearing, visual, and olfactory senses of the older adult was investigated and confirmed based on medical history and the information through self-reporting by the patient. Moreover, those having allergy to the essence while intervention, the candidates of kidney transplantation,<sup>[21]</sup> having other mental diseases,<sup>[14]</sup> and absence for more than three sessions while administering the intervention, not being interested in music, cancelling or not being intended toward continuing the participation in the study and those who died,<sup>[21]</sup> were excluded from the study. Finally, two groups were matched in terms of inclusion and exclusion criteria.

### Research tools

Data were collected using demographic and medical information questionnaire, AMT,<sup>[22]</sup> geriatric anxiety inventory (GAI),<sup>[23]</sup> and geriatric depression scale (GDS).<sup>[24]</sup> The demographic and medical information consisted of items regarding age, gender, living arrangement, underlying disease, depression, and anxiety experience in the past, drug number and hemodialysis experience. AMT having ten questions was utilized to assess the cognition, which had

been designed by Hodkinson and its validity and reliability had been confirmed by Foroughan *et al.* in Iran. The ideal cut off point was 6 and its sensitivity was 85% and its specificity was determined to be 99%; obtaining a score < 7.10 would be suspicious to dementia.<sup>[22]</sup>

Anxiety was measured using GAI. This questionnaire was designed by Paghana *et al.* (2007) to measure anxiety symptoms in older adults. The mentioned scale had 20 items, each having two options of yes or no and had three dimensions of cognition (11 items), arousal (5 items), and physical (4 items). The total number was between 0 and 20 and obtaining higher scores meant more anxiety. The validity and reliability of the GAI was confirmed by Bandari *et al.*, (2019) in Iran and Cronbach's alpha in the mentioned study was 0.957.<sup>[23]</sup> The Cronbach alpha for this questionnaire was 0.83 in this study.

Depression was measured using GDS. This scale was designed by Yessavage in 1983 to measure older adults' depression; it includes 15 items, each item having zero or one score. The response to the items has yes or no format. The score scope of this scale is between 0 and 15; higher scores show more depression.<sup>[25,26]</sup> The validity and reliability of this scale was confirmed by Malakouti *et al.*, in the older adult population of Iran and Cronbach's alpha was reported as 0.97.<sup>[24]</sup> The Cronbach's alpha for this questionnaire was 0.72 in the present study.

### Interventions

Multisensory stimulation intervention includes three stimulations of auditory, visual and olfactory. Auditory stimulation was done using the playing of a calm and speechless music along with the sounds of the nature; this was selected from the set of calm music along with nature sound (birds' songs and water sound) by Dan Gibson entitled as "evergreen."<sup>[14]</sup> Visual stimulation was done using nature pictures (showing pictorial slides along with playing the sound using headphone of the laptop). Auditory and visual stimulations were also done simultaneously for 10 min.<sup>[14]</sup> Then, the older adult was allowed to rest for 5 min, then olfactory (aromatherapy) was started for 10 min. The patients of multisensory stimulations smelled lavender essence diluted with sweet oil having the ratio of 1:20 (5% lavender essence); both were prepared from Barij essence pharmaceutical having the quality certificate of ISO 9001 and standard ISO/IEC 17025. Patients received lavender inhalation for 3 days in a week every other day for 4 weeks.<sup>[21]</sup> This was done in a way that a wadding soaked with three drops of lavender essence having the density of 5% (diluted with sweet almond oil of 1:20 ratio) was stuck to the pillar of the patient and he was asked

to breath as usual in the sitting position for 10 min.<sup>[21]</sup> Moreover, they were asked to not use any other perfumes or odors before or during the intervention. Finally, in the multisensory stimulation group, multisensory stimulation interventions were administered 3 days of a week every other day for 4 weeks.<sup>[14]</sup> Each session lasted for 25 min in total.<sup>[14]</sup> Aromatherapy patients also received aromatherapy interventions with lavender essence so that these patients received lavender essence inhalation that had been diluted by sweet oil of 1:20 ratio (5% lavender essence) for 10 min; both were prepared from Barij essence pharmaceutical having the quality certificate of ISO 9001 and standard ISO/IEC 17025. Patients received lavender inhalation for 3 days in a week every other day for 4 weeks.<sup>[21]</sup> Before starting the intervention, at the end of 2<sup>nd</sup> and 4<sup>th</sup> week after starting the intervention and 1 week after the end of intervention, anxiety, and depression were measured by the evaluator using geriatric depression and anxiety scales in both groups of multisensory stimulations and aromatherapy.<sup>[14,21]</sup>

### Statistical analysis

SPSS (International Business Machines Corporation, New York State, USA) was utilized to analyze the collected data. The normality of variables was investigated using Shapiro–Wilk test and the distribution of quantitative variables was not normal. The anxiety and depression of patients who excluded from the study during intervention were analyzed using intention to treat (ITT) method. Accordingly, to estimate the missing data, expatiated maximization (EM) algorithm was used and replaced. Therefore, overall, 24 individuals in the multisensory stimulation interventions and 24 individuals of aromatherapy groups were statistically analyzed. Data were described using the descriptive statistics such as number, percentage, mean and standard deviation. Mann–Whitney U and Fisher’s tests were utilized to compare the qualitative and quantitative demographic and medical variables between the two groups. In addition, Mann–Whitney U test was used to compare the mean of anxiety and depression, as divided by the time intervals to before and after the intervention between two groups (multisensory stimulation and aromatherapy groups). Furthermore, Friedman test was utilized to compare the mean of anxiety and depression over the various measurement times in each group. All tests were done at the significance level of 0.05.

### Ethical consideration

This study is the product of a Master’s dissertation on geriatric nursing approved under 5772, and registered as IRCTID: IRCT20170611034454N4 in the Iranian Registry of Clinical Trials with the ethical code of IR.MAZUMS.

REC.1398.1151. Patients were informed about study aims and procedures, that participation was voluntary, and would not affect medical care before signing an informed consent document. The patient confidentiality was assured by completing all study procedures in a quiet treatment area. All personal data were de-identified by assigning codes to the participants. In addition, it was not possible to blind patients and the evaluator researcher and only the statistical specialist was blind to analysis the data. Furthermore, it was not possible to blind patients and the evaluator researcher and only the statistical specialist was blind to analysis the data.

### RESULTS

The results of Shapiro–Wilk test showed that the data for the studied variables did not have a normal distribution. Therefore, nonparametric tests were used to analysis the data in the present study.

Participants in two groups (multisensory stimulation group and aromatherapy group) were compared in terms of demographic and medical information (age, gender, living arrangement, anxiety and depression history, hemodialysis history, drug number, and cognition); there was no statistically significant differences between the two groups before the intervention. Fifty percent of the participants in the multisensory stimulation intervention group and 54.2% of the participants in the aromatherapy group were female ( $P = 1.000$ ). 45.8% of the participants in each group had an anxiety history ( $P = 1.000$ ). 29.2% of participants in the multi-sensory stimulation intervention group and 37.5% of participants in the aromatherapy group had a depression history ( $P = 0.76$ ). The majority of participants in each group lived with their spouses (54.2% in the aromatherapy group and 33.3% in the multisensory stimulation intervention group) ( $P = 0.51$ ). Other details are presented in Table 1.

According to Friedman test, significance differences were found in the multisensory stimulation intervention group in terms of anxiety and depression changes during various measurement times (before starting the intervention, 2 and 4 weeks after the intervention and 1 week after the end of the intervention) ( $P < 0.001$ ). Based on Friedman test, also, significance differences were found in the aromatherapy group in terms of anxiety and depression changes during various measurement times (before starting the intervention, two and 4 weeks after the intervention and 1 week after the end of the intervention) ( $P < 0.001$ ). Furthermore, changes of the anxiety and depression over the times (before starting the intervention, 2 and 4 weeks

**Table 1: Comparison of the demographic and medical information between the two groups before the intervention**

Variable	Mean (SD)		P
	Multi-sensory simulation group (n=24)	Aromatherapy group (n=24)	
Age (years)	66.5 (4.99)	69.7 (8.05)	0.22
Hemodialysis history (years)	3.4 (2.46)	3.3 (2.00)	0.96
Drug number	9.2 (4.58)	8.1 (3.80)	0.48
Cognition	9.6 (0.76)	9.2 (1.03)	0.22

SD: Standard deviation

after the intervention and 1 week after the end of the intervention) in two groups are presented in Figures 2 and 3.

According to Mann–Whitney U test, no significant difference was found between the two groups in terms of the anxiety before starting the intervention, 2 and 4 weeks after starting the intervention and 1 week after the end of the intervention ( $P > 0.05$ ). Furthermore, according to Mann–Whitney test, no significant difference was found between the two groups in terms of the depression before starting the intervention, 2 and 4 weeks after starting the intervention ( $P > 0.05$ ); however, 1 week after the end of the intervention, there was a significant difference between the two groups in terms of the depression ( $P = 0.03$ ). The details are presented in Table 2.

## DISCUSSION

According to the findings of this study, older adults' anxiety and depression undergoing hemodialysis significantly reduced after multisensory stimulation interventions as compared to before intervention. The results of this study were in line with the results of the studies conducted on older adults of nursing home,<sup>[14]</sup> older adults having Alzheimer,<sup>[15]</sup> older adults having dementia,<sup>[27]</sup> and older adults hospitalized in CCU,<sup>[28]</sup> which reported that multi-sensory stimulation intervention reduced anxiety and depression. It seems that multisensory stimulation can reduce sensory deprivation dangers and facilitate the improvement of various responses using multisensory stimulations. Multisensory stimulation intervention awakens reticular activating system of the mind and leads to the improvement of processes related to the mind. In healthy axons, lateral relations entitled lateral shoots are created due to the effect of these stimulations that help to the re-organization of mental activities.<sup>[16]</sup>

Other results of this study pointed to the effect of aromatherapy with lavender essence on older adults' anxiety and depression undergoing hemodialysis; after intervention, the anxiety and depression reduced significantly. The results of this study were in line with the studies conducted on older adults,<sup>[29]</sup> older adults undergoing hemodialysis,<sup>[30]</sup> cancer patients,<sup>[31]</sup>

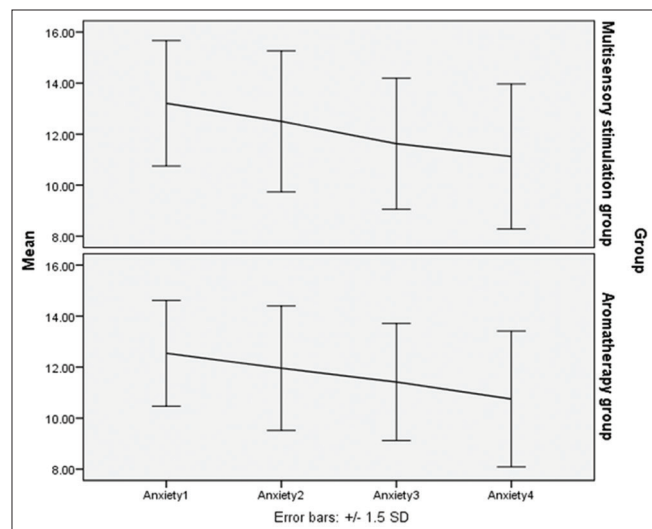
cardiovascular patients<sup>[32]</sup> concluding the aromatherapy with lavender had a significant effect on reducing patients' anxiety. Moreover, Tayebi *et al.*,<sup>[13]</sup> in their study, reported the significant effect of aromatherapy with lavender essence on reducing stress and depression; however, the effect of aromatherapy was not statistically significant on reducing the anxiety; this was not in line with the current study. The probable reasons of the difference can be the difference in tools measuring anxiety and depression. Other probable reasons of the difference in the results may be attributed to the duration of each aromatherapy session. In the study of Bagheri-Nesami *et al.*,<sup>[21]</sup> it had also been stated that aromatherapy with lavender essence was significantly effective on reducing depression; however, changes in the amount of anxiety were not significant in the mentioned study after the intervention compared to before the intervention; the results were not in line with the results of the current research. The probable reasons of the difference in the results of the current study can be the difference in some of the inclusion criteria to the study so that the current study was conducted on a certain age range groups (60 years old and more) including older adults. While, Bagheri-Nesami *et al.*'s study had not considered a certain age group and all individuals over 18 years could be included in the study. The tools measuring anxiety and depression were also different in both Bagheri-Nesami *et al.* study and the present study. In addition, despite the results of this study, the results of Seifi *et al.* study on patients undergoing coronary artery bypass surgery indicated that aromatherapy with lavender essence was not effective on reducing the anxiety of the patients.<sup>[12]</sup> The probable reasons of the difference of this study with the present study was the difference in the population of the study and the number of drops and concentration of lavender. The results of Sehhatie *et al.*, study on the postpartum depression showed that participants' depression after aromatherapy intervention with lavender was not significantly reduced.<sup>[33]</sup> The probable reasons behind the difference of the present study can be pointed to the difference in the kind of study population and the difference in the kind of intervention.

The results of this study indicated the significant difference between two groups of multisensory stimulations and

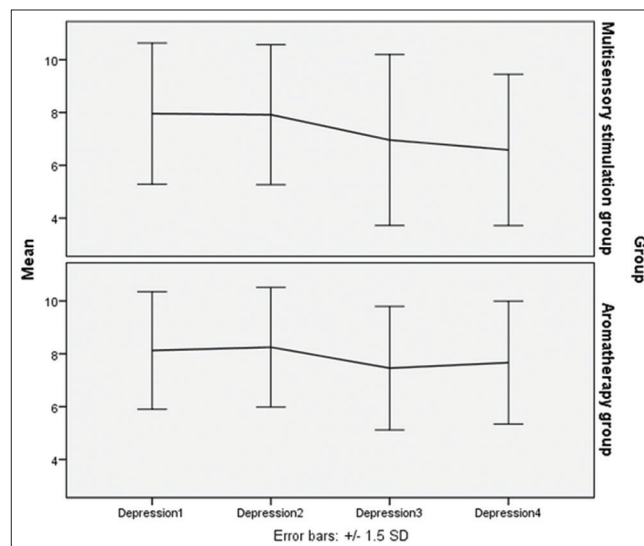
**Table 2: Comparison of the mean of anxiety and depression between the two groups before intervention, 2 and 4 weeks after intervention and 1 week after the end of intervention**

Variable (time)	Mean (SD)		P
	Multi-sensory simulation group (n=24)	Aromatherapy group (n=24)	
Anxiety (before intervention)	13.20 (1.64)	12.54 (1.38)	0.17
Anxiety (2 weeks after intervention)	12.50 (1.84)	11.95 (1.62)	0.26
Anxiety (4 weeks after intervention)	11.62 (1.71)	11.41 (1.52)	0.82
Anxiety (1 week after the end of intervention)	11.12 (1.89)	10.75 (1.77)	0.61
Depression (before intervention)	7.95 (1.78)	8.12 (1.48)	0.73
Depression (2 weeks after intervention)	7.91 (1.76)	8.25 (1.51)	0.47
Depression (4 weeks after intervention)	6.95 (2.15)	7.45 (1.55)	0.34
Depression (1 week after the end of intervention)	6.58 (1.90)	7.66 (1.55)	0.03

SD: Standard deviation



**Figure 2:** Anxiety changes in each group before intervention, 2 and 4 weeks after intervention and 1 week after the end of intervention



**Figure 3:** Depression changes in each group before intervention, 2 and 4 weeks after intervention and 1 week after the end of intervention

aromatherapy regarding depression after the intervention. While, there was no significant differences between two groups regarding anxiety after the intervention. In this regard, considering the available data, no studies have been carried out in terms of comparing multi-sensory stimulation intervention and aromatherapy on the anxiety and depression of older adults; therefore, similar studies have been investigated in the following parts. Sánchez *et al.*, conducted a study that the results of the study were showed that multisensory stimulation had more positive effect on anxiety and cognition after the intervention as compared to the music group.<sup>[18]</sup>

**CONCLUSION**

According to the results of the present study, multisensory stimulation intervention and aromatherapy intervention with lavender essence were effective on reducing the anxiety and depression of the older adult undergoing hemodialysis. Therefore, according to the results, it seems that both intervention methods of multisensory stimulation and aromatherapy, as easy and safe

nonpharmacological strategies, could be effective in improving the anxiety and depression of the older adult undergoing hemodialysis. Furthermore, having compared these two methods, it was revealed that multi-sensory stimulation was more effective than aromatherapy; however, to improve anxiety, there was no certain preferences in the usage of these two interventions. Thus, the selection of each of these nonpharmacological strategies can be done based on individual interests and preferences and their mental status as well as consulting with experts of this field.

According to the findings of the present study, the results are important in management, education and clinical aspects. The management aspect includes organizing systematic and coherent programs and helping to provide support facilities. Education aspect includes training aromatherapy and multisensory stimulation to empower students, and clinical aspect includes providing these interventions to improve anxiety and depression. In addition, the results of the present study can also be a clue

to further research to improve the mental health of the elderly undergoing hemodialysis. It is also recommended for future studies to comparison multisensory stimulation and aromatherapy on other outcomes such as cognition and well-being in the elderly with other diseases such as cancer.

### Limitations

Lack of touch stimulation and massage due to cultural and religious issues and restrictions that because the gender of the researcher was female and it was not possible to stimulate touch in male elderly is one of the limitations of this study.

### Conflicts of interest

There are no conflicts of interest.

### Authors' contribution

All authors contributed equally to the writing of the scientific proposal, data collection, and manuscript drafting. The final manuscript was reviewed and approved by all the authors.

### Financial support and sponsorship

This study was supported by Mazandaran university of medical sciences in Sari, Iran.

### Acknowledgement

This article was derived from a nursing Master Science degree thesis conducted in Mazandaran University of Medical Sciences. The authors would like to thank the deputy of research & technology of Mazandaran University of Medical Sciences, Sari, Iran for their support, cooperation and assistance throughout the period of study (Grant number :5772).

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