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Original Research Article

The Effects of Listening to Music on Vital Signs and Anxiety in Hemodialysis Patients

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ABSTRACT

Objective: This study was conducted in order to determine the effects of music on vital signs and anxiety in hemodialysis patients.
Method: This was randomized controlled (pre-test post-test) experimental study. In line with power analysis, a total of 46 patients who were receiving hemodialysis treatment were included in the study in two groups: 23 in the experimental group and 23 controls. The patients in the experimental group listened to music for 30 minutes during their treatment. The patients' vital signs and anxiety were evaluated before the application, and in the 30th minute and 1st, 2nd, 3rd and 4th hours of hemodialysis.
Results: No significant difference was found between the mean vital signs scores of the two groups for any of the times ($p<0.05$). In patients in the experimental group, it was seen that mean blood pressure in the 3rd hour of hemodialysis ($z=-2.265$, $p=0.024$) and mean breathing rate in the 4th hour of hemodialysis ($z=-2.028$, $p=0.043$) showed a statistically significant reduction. There was a statistically significant difference between the mean anxiety scores of the two groups of patients for all times ($p<0.05$). The mean anxiety score of the experimental group patients showed a statistically significant reduction in the 30th minute of dialysis ($z=-3.821$, $p= 0.000$).
Conclusion: The research findings show that music has a reducing effect on anxiety in hemodialysis patients.

Key words: Music, Hemodialysis, Anxiety, Vital Signs

INTRODUCTION

Hemodialysis (HD) is a treatment method used for patients with kidney failure. [(1-3)]A life dependent on HD treatment has a negative effect on a person's role and functions. In particular, the necessity for coming to the clinic on certain days every week, the fact that the treatment is life-long, the consequent loss of working ability and dependence on family members bring physiological, economic and mental problems related to the illness. [(2)] HD treatment creates stress and anxiety in patients. Many HD patients experience psychological problems such as depression and anxiety under physical and psychological stress. [(1,3)] Patients with chronic health problems such as kidney failure prefer the methods of complementary medicine to alleviate such problems as hypertension, sleeplessness, depression, anxiety and fatigue. [(2)]

One alternative nursing practice is music, which affects anxiety, a natural reaction when people feel that they are under physical or physiological threat or when they face one of the stressors of life. [(4,5)] Turkish music includes many maqams

such as Rast, Irak, Rehavi, Hüseyni, Hicaz, Nihavend, and Uşşak. The effects of these maqams can be classed according to illnesses, the planets, the days of the week, the hours of the day, and the patient's personality or nationality. The maqam most favored by Turkish people, Uşşakmaqam, is of benefit for discomfort in the heart or the feet. It induces laughter and feelings of love, strength and heroism. The Hicazmaqam has an effect in the treatment of the bones, the brain and childhood illnesses, and affects the bones, the brain, the urogenital system and the kidneys. And the Nihavendmaqam has an effect on the blood circulation, the abdominal area, the hips, the thighs and the legs. It is of benefit for cramp, back pain and blood pressure problems. [6] Erdoğan et al. (2013) reported that music, a complementary medicine method of body and mind intervention, was among the methods most chosen by HD patients. It has been shown in many studies that allowing HD patients to listen to different kinds of music such as classical or new age music, Rast and Uşşakmaqams, pop music, folk music or jazz had a positive effect on anxiety. [1,3,7-9] However, there are also studies which indicate that music has no positive effect on vital signs in HD patients. [3,9,10] Starting from this literature, the present study was planned with the aim of determining the effect of music on anxiety and vital signs in HD patients.

METHOD

Research Type: This research was conducted as a randomized controlled study (pre-test, post-test) with the aim of determining the effect of music on anxiety and vital signs in HD patients.

Research Population and Sample: The population of the study was made up of the 68 patients who came for HD treatment to the outpatients' dialysis center of the Manisa Public Hospitals Association's Manisa State Hospital between 8 August and 5 December 2016.

The research sample consisted of patients being treated at the dialysis center between 8 August and 5 December 2016 who fitted the sampling criteria, and who agreed to participate in the study. The inclusion criteria were agreeing to take part in the study, being literate, being over the age of 18, receiving HD treatment with bicarbonate, having a pump flow rate of 250-450, and not having a cognitive or sensory impairment or an impediment to oral communication. Eighteen patients did not fit the inclusion criteria, two got bored with listening to the music, and two chose not to continue while completing the anxiety form in the fourth hour of the study, so that a total of 22 patients were excluded from the study. In accordance with the results of Power Analysis to determine the number of patients in the sample, 23 were taken into the experimental group and 23 into the control group, a total of 46. In the assessment of the sample size of the study (d) as 46, the effect size was found to be 0.80, the alpha value 0.05 and the power 0.75%. Randomization was achieved by assigning patients who came for dialysis on Mondays, Wednesdays and Fridays to the experimental group and those who came on Tuesdays, Thursdays and Saturdays to the control group.

A comparison was made between the groups of patients' socio-demographic and illness characteristics. No statistically significant difference was found between the groups in terms of gender (X^2= 1.394, p= 0.238), mean age (z=-0.440, p=0.660), educational level (X^2= 0.789, p= 0.375), time since diagnosis of chronic kidney failure (CKF) (kW= 0.906, p= 0.341), or other chronic illnesses (X^2 = 0.000, p= 1.000).

Data Collection: The forms used for data collection in the study were completed by the researchers in face to face interviews with the patients. An Informed Voluntary Consent Form developed by the researchers, a Patient Description Form and a Form for the Effect of Music on Vital Signs were used in the study. In addition, the State Trait Anxiety Inventory was used to determine the patients' anxiety. After patients were

given information orally, their written permission was obtained using the Informed Voluntary Consent Form.

The *Patient Description Form* was prepared by the researchers in line with the literature, taking into account similar studies assessing patients undergoing HD treatment, and consisted of 11 questions covering patients' socio-demographic characteristics and information on their illness.

The *Form for the Effect of Music on Vital Signs* gathered such information as blood pressure, pulse rate and breathing rate before the application of music, in the 30th minute of the music application, and in the first, second, third and fourth hours of HD.

The state Trait Anxiety Inventory (STAI) was developed by Gorsuch and Lushene (1970), and consists of two subscales on state and trait anxiety, each with 20 questions. It can be applied to individuals over the age of 14. The state anxiety scale shows how the individual feels temporarily at a particular moment and under particular conditions, while the trait anxiety scale is more general, and shows how the individual feels independent of the current state and conditions. [(11)] Adaptation of the STAI to Turkish and validity and reliability testing were performed by Öner and Le Compte(1983). State and trait anxiety scores are calculated separately. The total score obtained from each scale varies between 20 and 80. A high score shows a high level of anxiety, while a low score indicates a low anxiety level. Spielberger et al. define a score of 0-19 as *no anxiety*, 20-39 as *slight anxiety*, 40-59 as *medium anxiety*, and 60-79 as *severe anxiety*, and state that a person with a score of 60 or more is in need of professional help. [(11)] Before the application of this study it was found that the Cronbach's alpha value of the patients of the experimental group was 0.44 and that of the control group was 0.81, while the Cronbach's alpha value of the total STAI was 0.75. Completing the forms and the inventory took approximately ten minutes. In order to conduct the study in an effective way, the surroundings were kept as quiet as possible and an attempt was made to avoid things which would distract the patients' attention from focusing on the music such as watching television, or having treatment coincide with a mealtime.

Application of the Procedure

Experimental group: After obtaining the patients' written approval and before HD, the patients were placed in the seats in which they were to receive treatment. After five minutes of rest, the Patient Description Form was completed and vital signs were measured. In each section of time (before the procedure, and in the 30th minute and first, second, third and fourth hours of HD) vital signs were measured manually and the results were recorded on the Form for the Effect of Music on Vital Signs. Patients took up a relaxing position, and from the beginning of the HD treatment, they were allowed to listen to music for 30 minutes during the treatment. In preparing the music, 30 minutes of music in the Hicazmaqam, which has a powerful effect on the urogenital system and the kidneys, and the Nihavendmaqam, which is effective at noon and is beneficial for the blood circulation and high blood pressure, from a CD by the group TÜMATA were uploaded to an mp3 player, and the patients listened individually using earphones. In the literature it has been reported that listening to music for long periods can cause discomfort, and so listening for 15-30 minutes is suitable. [(1,3,12)] Each patient was given the same music, earphones were used to exclude outside sounds, and the earphone sponges were changed for each patient. Before the start of the music, in the 30th minute of the music and in the fourth hour of HD, the STAI was applied in order to determine patients' anxiety.

Control group: Apart from the standard HD treatment, no intervention was performed on the control group. Before HD, patients were seated in the chairs in which they were to receive treatment. After five minutes of rest, the Patient Description Form and STAI were applied, and vital signs (blood pressure, pulse rate and breathing rate) were

taken. Patients were placed in a comfortable position and throughout the HD procedure they were allowed to take bed rest. During HD, their vital signs and anxiety levels were assessed in the 30th minute. In the first, second and third hours of HD, only vital signs were taken, while in the fourth hour, vital signs and anxiety were assessed.

Data Analysis: Assessment of data was performed using the package SPSS 21, and numerical data, percentage distributions and chi-square analysis results were presented. The difference according to time between the mean vital signs and anxiety scores of all patients was determined by Repeated Measures Variance analysis, and the Bonferroni test was performed for advanced analysis. The difference between the vital signs and anxiety scores of the groups for each time was determined using the Mann Whitney U test. The confidence interval in the research analysis was taken as 95%, and the level of significance as $p<0.05$.

Research Ethics: This research was begun after written approval had been obtained from the General Secretariat of the Manisa Public Hospitals Association, the Chief Physician of Manisa State Hospital, and the Local Ethics Committee of ManisaCelal Bayar University (Ethics Committee approval No. 20478.486-295). After information had been provided to the patients on the purpose and duration of the research, informed voluntary consent was obtained from those who agreed to participate in the study.

RESULTS

Patients' socio-demographic and illness related characteristics

The mean age of the patients in the study was 59.00±16.09 years, 52.2% were female, 87.0% were married, and 87.0% were literate or had finished primary school. It was found that for 73.9% of the patients their income matched their expenses, 97.8% were not working, 47.8% had been diagnosed with CKF 0-1 years previously, 84.8% did not have family members with a diagnosis of CKF, and 43.5% had an additional chronic illness. The patients stated that the types of music which calmed them the most were, in order, 89.1% Turkish folk music, 89.1% Turkish classical music, 8.7% pop and arabesque, and 4.4% other kinds of music. 78.3% of the patients in the experimental group rated the music they were given to listen to as good (Table 1).

Table 1. Patients' Socio-demographic and Illness Related Characteristics

Socio-demographics	No	%
Age		
28-49	13	28.2
50-69	20	43.5
70-89	13	28.3
X= 59.00±16.09		
Gender		
Female	24	52.2
Male	22	47.8
Marital status		
Married	40	87.0
Single	6	13.0
Educational level		
Literate	21	45.7
Primary school	19	41.3
Middle school	5	10.8
Postgraduate qualification	1	2.2
Income status		
Income > expenditure	10	21.7
Income = expenditure	34	73.9
Income < expenditure	2	4.4
Work status		
Working	1	2.2
Not working	45	97.8
Years since CKF diagnosis		
0-1	22	47.8
2-5	10	21.7
6 yrs or more	14	30.5
(min:1, max:20)		
CKF diagnosis in the family		
Yes	7	15.2
No	39	84.8
Other chronic illness		
Yes	20	43.5
No	26	56.5
The kind of music that calms you*		
Turkish folk music	41	89.1
Turkish classical music	41	89.1
Pop	4	8.7
Arabesque	4	8.7
Other (classical and jazz)	2	4.4
Enjoyment of the music (n=23)**		
Good	18	78.3
Not bad	5	21.7
Bad	0	0.0
Total	46	100

*More than one choice was marked.
**Only the experimental group were asked.

Patients' vital signs

Table 2 shows a comparison of patients' mean vital sign scores by time. No statistically significant difference was found between the groups by time in the mean scores of systolic blood pressure (F=0.894, P=0.494), diastolic blood pressure

(F=0.685, P=0.638), pulse rate (F=0.618, P=0.687), or breathing rate (F=0.749, P=0.592) (p>0.05).

A statistically significant difference was found between the mean systolic blood pressure scores at all times for patients in the experimental group (F=12.528, P=0.000). For the control group patients also, a statistically significant difference was found between the mean systolic blood pressure scores at all times (F=6.548, P=0.001).

A statistically significant difference was found between the mean diastolic blood pressure scores at all times for patients in the experimental group (F=3.062, P=0.013). For the control group patients also, a statistically significant difference was found between the mean diastolic blood pressure scores at all times (F=3.618, P=0.019).

No statistically significant difference was found in patients of either the experimental or the control group at all times between their mean scores for pulse rate (p>0.05) or breathing rate (p>0.05) (Table 2).

Comparing the mean vital signs scores of all patients within each measurement, statistically significant differences were found in mean systolic blood pressure scores between the groups in the third hour of HD treatment (z=-2.265, P=0.024), and in the mean breathing rate scores between the groups in the fourth hour of HD treatment (z=-2.028, P=0.043). No statistically significant difference was found between the groups' mean vital signs scores at measurement times other than these (p>0.05, Table 2).

Table 2. Comparison of Patients' Vital Signs Mean Scores by Time

Variable	Group	Time								
		Before procedure[1] Mean (sd)	30th min[2] Mean (sd)	1st hr[3] Mean (sd)	2nd hr[4] Mean (sd)	3rd hr[5] Mean (sd)	4th hr[6] Mean (sd)	F, p[a] values	Bonferroni test	
SBP	Exp. (n=23)	111.73 (21.24)	111.30 (19.14)	111.30 (23.60)	105.86 (22.08)	101.73 (22.89)	100.00 (19.30)	F=12.528 P=0.000*	1>5,1>6,2>5, 2>6,3>5,3>6, 4>6	
	Control (n=23)	118.69 (19.61)	116.52 (20.58)	115.21 (19.97)	113.04 (21.41)	112.17 (19.05)	107.39 (21.15)	F=6.548 P=0.001*	1>5,1>6,2>6, 3>6, 5>6	F=0.894 P=0.494
	[b]z, p	z=-1.312 p=0.190	z=-1.139 p=0.255	z=-0.836 p=0.403	z=-1.419 p=0.156	z=-2.265 p=0.024*	z=-1.443 p=0.149			
DBP	Exp. (n=23)	66.08 (9.88)	62.17 (10.42)	64.78 (10.81)	64.34 (11.60)	61.73 (10.72)	61.30 (10.57)	F=3.062 P=0.013*		F=0.685 P=0.638
	Control (n=23)	70.43 (12.23)	66.08 (11.17)	66.08 (9.88)	64.34 (9.92)	70.43 (12.23)	63.47 (10.27)	F=3.618 P=0.019*	1>2, 1>5	
	[b]z, p	z=-1.166 P= 0.244	z=-1.049 P= 0.294	z=-0.466 P= 0.641	z=-0.256 P= 0.796	z=-0.739 P= 0.460	z=-1.050 P= 0.294			
Pulse rate	Exp. (n=23)	79.56 (9.45)	78.00 (9.28)	77.30 (8.85)	76.86 (9.14)	77.04 (9.12)	76.78 (9.19)	F=2.318 P=0.086		F=0.618 P=0.687
	Control (n=23)	78.34 (8.26)	76.60 (8.34)	77.30 (8.01)	76.78 (7.59)	76.43 (8.02)	76.26 (8.07)	F=1.843 P=0.155		
	[b]z, p	z=-0.575 P= 0.565	z=-0.819 P= 0.413	z=-0.530 P= 0.596	z=-0.154 P= 0.877	z=-0.397 P= 0.691	z=-0.452 P= 0.651			
Breathing rate	Exp. (n=23)	17.65 (3.65)	17.47 (3.42)	17.30 (3.49)	17.47 (3.52)	17.56 (3.61)	17.30 (3.69)	F=0.711 P=0.617		F=0.749 P=0.592
	Control (n=23)	19.39 (3.73)	19.47 (3.42)	19.39 (3.38)	19.39 (3.48)	19.47 (3.36)	19.47 (3.36)	F=0.193 P=0.965		
	[b]z, p	z=-1.592 P= 0.111	z=-1.871 P= 0.061	z=-1.903 P= 0.057	z=-1.710 P= 0.087	z=-1.818 P= 0.069	z=-2.028 P=0.043*			

Exp.: Experimental group, SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, Mean: Mean score, sd: standard deviation,
a: Repeated measures variance analysis, b:Mann Whitney U test,
1 (Before procedure): Immediately before HD treatment;
2 (30th min): the 30thminuye of HD treatment, at the same timethe end of music application (experimental group);
3 (1sthr): the 1st hour of HD treatment;
4 (2ndhr): the 2nd hour of HD treatment;
5 (3rdhr): the 3rd hour of HD treatment; 6 (4thhr): the 4th hour of HD treatment
*p<0.05

Patients' anxiety scores

Patients' mean anxiety scores were compared according to time (Table 3). A statistically significant difference was found between the mean anxiety scores of the patient groups for all times (F=13.261, P=0.000). In patients of both the experimental group (F=23.829, P=0.000) and the control group (F=19.117, P=0.000), a statistically significant difference was found between the mean anxiety scores for all times. Before the procedure (z=-1.108, P= 0.268) and in the fourth hour of HD treatment (z=-0.290, P= 0.772), there was no statistically significant difference between the mean anxiety scores of the groups. In the 30th minute of HD treatment, there was a statistically significant difference between the mean anxiety scores of the groups (z=-3.821, P= 0.000).

Table 3. Comparison of Patients' Mean Anxiety Scores According to Time

	Group	Before procedure[1] Mean (sd)	30th min[2] Mean (sd)	4th hr[3] Mean (sd)	[a]F and p values	
Mean anxiety scores	**Exp. (n=23)**	40.69 (2.40)	35.39 (4.43)	36.82 (3.99)	F= 23.829 P= 0.000* [c]1>2, 1>3	[a]F= 13.261 P= 0.000*
	Control (n=23)	43.13 (5.14)	42.43 (5.75)	37.91 (6.00)	F= 19.117 P= 0.000* [c]1>3, 2>3	
	Z and p values	z=-1.108 p= 0.268	z=-3.821 p= 0.000*	z=-0.290 p= 0.772		

Exp.: Experimental group
Mean: Mean score, sd: standard deviation
a: Repeated measures variance analysis, b:Mann Whitney U test, c: Bonferroni test
1 (Before procedure): Immediately before HD treatment
2 (30th min): 30th minute of HD treatment, at the same time the end of the music application (experimental group)
3 (4thhr): 4th hour of HD treatment
*p<0.05

DISCUSSION

Patients' vital signs

An important point to emphasize concerning music is that people are more affected by music from their own culture, [5,13] and that different maqams and instruments are of benefit according to the type of illness. [14] The Nihavendmaqam of classical Turkish music used in this study is effective on disorders of mental health, while the Hicazmaqam has a strong effect on the urogenital system and the kidneys. These are two of the oldest maqams. The Hicazmaqam is also beneficial for problems of the blood circulation, the abdominal area, the hips, thighs and legs, cramp, backache and high blood pressure. [6,15] In this study, no statistically significant difference was found between the patient groups for any time with respect to systolic and diastolic blood pressure and pulse or breathing rate. A statistically significant difference was found between mean systolic and diastolic blood pressure scores of the patients in both the experimental and the control groups for all times, but no statistically significant difference was found between mean pulse or breathing rate scores. This difference in patients' blood pressure does not indicate a clinically significant difference. This is because in the measurements made before and after the procedure, blood pressure values were within physiologically normal limits. Also, when excess fluid is taken rapidly from HD patients in the treatment process, hypotension can occur. [16] For this reason, this reduction in the values of the vital signs of all of the patients may arise from the treatment process. In the literature, there are very few studies examining the effects of music on vital signs in HD patients.

In studies with similar findings to the present study, Chung (2004) found that music listened to during routine HD caused a drop in systolic blood pressure but this was not significant; however, it caused a significant drop in diastolic blood pressure. Also, no significant difference was found in pulse or breathing rates. [17] Burrai et al. (2014) did not find a significant difference in the physical parameters of 57 patients in

an experimental group listening to 30 minutes of live saxophone music during HD. A significant difference was found between two groups in terms of O_2 saturation. [(10)] In a study by Pothoulakiet al. (2008), no significant difference was found in vital signs when music was listened to during routine HD. [(9)] Lin et al. (2012) did not find a significant difference in systolic or diastolic blood pressure or in pulse rate in patients listening to music during HD, but did find a significant difference in breathing and O_2 saturation. [(3)] In contrast to the findings of the present study, among studies examining the effects on vital signs of music in different populations, a significant difference was found between the systolic and diastolic blood pressure values of patients in an experimental group in a study examining the effect of music on hypertension patients by Zanini et al. (2009), but no significant difference was found between blood pressure values of patients in a control group. [(18)] In a study by Barclay and Vega (2005) conducted to assess the effects of music treatment on the pulse rate, breathing rate and oxygen needs of patients with cardiovascular disease, patients were given slow music to listen to, which had a relaxing effect. [(19)] In the conclusion of the study, it was found that slow music reduced patients' pulse rate, breathing rate and oxygen need. In a study by Karadağ andKaradakovan(2015), it was found that when Turkish classical music was played for 30 minutes before sleep for four days to patients receiving HD treatment, there was a reduction in the patients' systolic and diastolic blood pressure values and in their pulse and breathing rates. [(20)] Studies have shown similar differences in the effects of music on vital signs with different sampling methods and different application durations. Although music showed a reducing effect on blood pressure in the present study, the reduction in the control group and also the fact that blood pressure measurement values for all times were at physiological values suggest that this reduction had no clinical significance. As the hemodynamic values of all patients before and after the procedure were at physiologically normal levels, the reduction in values after the application of music was not found to be significant. For this reason it is not thought that music provided hemostatic balance in patients.

Patients' anxiety scores

CKF is a long-lasting, progressive disease resulting in irreversible damage to kidney function. [(21)] The HD treatment which is given to patients, the frequent checkups, and dependence on dialysis units [(22)] affect them socially, economically and psychologically. [(23-25)] It is known that this is the reason why anxiety plays a large role in HD patients. [(9)] In the present study a reduction was seen in mean anxiety scores for all times in the patients both of the experimental group and the control group. It is thought that while anxiety was reduced under the effect of the music applied to the patients in the experimental group, on the other hand anxiety in the control group also saw a reduction over time. Thus, it was seen that music did not have an effect on anxiety by time. However, in studies which have researched the physiological effects of music, it has been stated that music has affected recovery because of changes which it has caused to the neuroendocrine system. [(26)] Studies have shown that listening to music affects pain, anxiety and memory by increasing endogen opioid secretion from the pituitary gland. At the same time, music reduces the level of catecholamine, thus increasing the level of phenylethylamine, a neuroamine which affects anxiety levels, and reducing levels of corticotropin-releasing hormone (CRH), adrenocorticotropic hormone (ACTH) and cortisol, which are released in situations of stress. [(26,27)] In agreement with the literature, the lack of statistically significant difference between groups in the mean anxiety scores before HD treatment and in the fourth hour of treatment, and the significant reduction in the level of mean anxiety scores of patients at the end of the first 30-minute music application in this study suggest that this

difference is due to the effect of music. Salehi et al. (2016) reached the conclusion that music played for three hours to 83 patients during HD was effective in reducing anxiety and depression levels. [(7)] In the study by Cantekin and Tan (2013), it wasfoundthatafter playing music in the Uşşak and Rastmaqams three times a week for 30 minutes during HD, the anxiety scores of patients in the experimental group were reduced and that this difference was statistically significant. However, the anxiety scores of the control group patients after pre-test post-test were similar but the difference was found not to be statistically significant. [(1)] In a study by Kim et al. (2006), it was found that when HD patients were allowed to listen to the music of their choice for between 30 and 50 minutes nine times in three weeks during routine HD, their anxiety levels were reduced to a significant extent. [(8)] Pothoulaki et al. (2008) found during routine HD patients in an experimental group who listened to music which they had chosen in a study with 30 experimental and 30 control group patients, that the anxiety level was a significant decrease. [(9)] In the study by Chung (2004), it was found that music listened to a total of twelve times for three hours a day over four weeks of routine HD caused a significant fall in state anxiety levels. [(17)] In a study by Lin et al (2012), a significant difference was found in the level on the HD stress scale in elderly patients allowed to listen to music three times a week during HD. [(3)] Despite differences in method between the present study and other studies in the literature, it was seen that different types of music were effective in lowering anxiety levels in HD patients.

CONCLUSION AND RECOMMENDATIONS

It was concluded that music listened to by patients receiving HD treatment had an effect on their anxiety, but not on their vital signs. In order to reduce patients' anxiety in HD clinics, listening to music at intervals for longer periods and listening to music by nurses is recommended.

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