Archives of Anesthesiology and Critical Care (Jul-Aug 2026); 12(4): 356-361.

Available online at http://aacc.tums.ac.ir

Research Article

The Effect of Using Virtual Reality on Pain and Comfort in Breast Cancer Patients Undergoing Chemotherapy

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ARTICLE INFO

Article history:
Received 26 June 2025
Revised 17 July 2025
Accepted 31 July 2025

Keywords:
Virtual reality;
Pain management;
Chemotherapy;
Patient comfort;
Breast cancer;
Oncology

ABSTRACT

Background: Breast cancer can lead to pain and reduced comfort in individuals and affect their lives. Therefore, planning to maintain or improve the level of comfort and pain management in these patients with training focused on virtual reality seems necessary. Therefore, the present study aimed to investigate the effect of using virtual reality on pain and comfort in breast cancer patients undergoing chemotherapy in Zahedan.

Methods: This randomized clinical trial was conducted on 90 patients undergoing chemotherapy at Khatam Al-Anbiya Hospital in Zahedan. Participants were randomly assigned to two intervention groups (n=45) and control groups (n=45). The intervention group used Samsung Gear VR in the first 15 minutes of chemotherapy, while the control group did not receive any intervention. Data collection included the McGill Pain Questionnaire (MPQ) and the Hospital Comfort Questionnaire (HCQ), which were administered before and after chemotherapy. Data were analyzed using SPSS 21 software with paired and independent t-tests.

Results: The mean pain score in the intervention group decreased significantly after using VR (pre: 42.00 ± 12.99, post: 30.77 ± 11.6, p=0.0001), while no significant change was observed in the control group (p>0.05). Similarly, the comfort level in the VR group improved significantly compared to the control group (p<0.05).

Conclusion: The use of virtual reality significantly reduced pain and increased comfort in chemotherapy patients. Implementing VR as a non-pharmacological method in pain management protocols can improve the quality of life and treatment experience of cancer patients.

Introduction

Cancer is defined as the rapid growth of abnormal cells that can spread to other organs and is one of the leading causes of death in developed and developing countries. Considering the epidemiological and demographic changes of the population and the changing mortality pattern in Iran, cancer is the third leading cause of death after cardiovascular diseases and accidents [1].

Female and breast diseases account for 7.8 and 25.6 percent of all female cancers in Iran, respectively, which are lower than in other countries. Although Iran has one of the lowest rates of breast cancer in the world, with an

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DOI: 10.18502/aacc.v12i4.21790

incidence rate of 24 cases per 100,000, it is the most common cancer among Iranian women due to changes in risk factors and demographic patterns. It is predicted that in the coming decades, the country will experience an increase in breast cancer incidence. The average age of breast cancer diagnosis in Iran is approximately 46 to 49 years [3], which is extremely stressful and often leads to depression, resulting in numerous adverse physical, psychosocial, and economic consequences for both patients and their families [4]. Furthermore, breast cancer treatment regimens can cause significant changes in daily life, reduced quality of life, memory impairment, and disruption of interpersonal relationships among patients atients [5].

Therefore, patients face problems such as fear of death, unresolved issues, separation from family, and pain. Psychological distress is characterized by the inability to cope effectively with a stressor, which can lead to symptoms of depression, stress, and anxiety that are closely related to physical symptoms. Loss of interest, sadness, hopelessness, restlessness, tension, insomnia, headache, and Lack of energy is one of the most common features of psychological distress, which can affect social functioning and daily life among cancer patients. The prevalence of psychiatric disorders following the initial diagnosis of cancer has been reported to range between 14% and 38%. Feelings of depression and hopelessness are among the most frequent psychological disorders in cancer patients and are closely associated with each other [4].

Another major concern for cancer patients is pain tolerance and efforts to reduce it [6]. Pain is one of the most common complaints that leads to visits to primary care providers and results in significant costs [7]. In breast cancer patients, cancer pain is most often caused by breast surgery or chemotherapy [8].

There are several ways to control pain, one of which is distraction, one of the subcategories of which is virtual reality. By placing virtual reality goggles on the user's eyes, after viewing this virtual environment for a while, his mind likens it to the real environment. This technology allows the user to interact with the virtual environment, and pain is reduced by reducing the patient's attention from the real world [9].

In recent years, its use has expanded for various clinical reasons, including pain management [10], physical rehabilitation [11], and treatment of psychiatric disorders [12]. However, there are still limited studies on the effect of virtual reality on pain and comfort in breast cancer patients undergoing chemotherapy.

Therefore, the present study aimed to investigate the effect of using virtual reality on pain and comfort in breast cancer patients undergoing chemotherapy in Zahedan.

Methods

The present study was conducted using an experimental method. The research population consisted of all patients with breast cancer. The sample size was 45 people in each group according to the study of Vazquez et al. and according to the pain score using the formula for comparing the average of the two populations. The final sample size was 90 people.

Thus, a total of 90 people were enrolled in the study using the available method and were randomly assigned to the intervention and control groups. The inclusion criteria included patient consent; the patient had good vision, the patient had good hearing, the age was between 18 and 54, breast cancer, being treated with injectable chemotherapy, not being end-stage patients, not being addicted to drugs, not having underlying disease, not using nephrotoxic drugs, having undergone radical mastectomy, not having dementia, not having motion sickness, not having stroke, not having seizures or epilepsy, and having undergone at least one course of chemotherapy. The exclusion criteria included patients experiencing nausea or vomiting during sampling, patients with breast cancer metastasis to other organs during sampling, phobia of the forest, and other images used in virtual reality. Data collection tools included the McGill Pain Questionnaire (MPQ) and Hospital Comfort Questionnaire (HCQ). After obtaining permission and visiting the research environment, the researcher selected the desired samples after reviewing the inclusion criteria. Then, after explaining the objectives of the study and obtaining written and informed consent from the patients, using a case-control study, 90 patients were included in the study and 45 patients were selected in each group using a simple random sampling method. The allocation of samples to the two study groups was simple random. In the test group, virtual reality glasses of the SAMSUNG brand, model GEAR VR, were used once from the beginning of the injection and receipt of chemotherapy drugs for 15 minutes, and no device was provided in the control group. The questionnaires were completed by the researcher after explaining all the items of the questionnaire to the individual. The control group, for whom no intervention was performed, was provided with a questionnaire before and after receiving chemotherapy, and the test group was provided with questionnaires before and after the intervention. The results were recorded in the questionnaire. In both groups, the McGill Pain Questionnaire and the Hospital Comfort Questionnaire (HCQ) were made available to them before and after the procedure to record the severity of pain and the level of comfort of the patients with the current condition. After collecting the data in this study, it was entered into Microsoft Excel 2016 and called up to SPSS version 21 for data analysis. Descriptive statistics were divided into two parts: quantitative and qualitative.

In the quantitative part, the data was described using central criterion indicators (mean, median) and dispersion (variance, standard deviation, coefficient of variation), and in the qualitative part, the data was described using frequency and percentage of cases. In the inferential statistics part, after the data were normalized, intergroup comparisons were made using parametric tests (independent t-test and paired t-test, ANOVA). The significance level for all tests was considered to be 0.05.

Results

In the present study, a study was conducted on 90 patients with breast cancer. The results showed that the age of the participants in the control and experimental groups was the same, and no significant difference was observed between the ages in the study groups. The mean age in the control group was 44.02 years, and in the experimental group it was 46 years, which was not statistically significant (p=0.11). According to the observed p-value, the number of chemotherapy treatments in the control and experimental groups was the same, and the difference observed in the two groups was not statistically significant (p>0.05). And the number of chemotherapy treatments in the two study groups was the same (Table 1). Also, the educational level variable was the same in the two experimental and control groups, and the difference observed between the number of people at different educational levels in the two study groups was not statistically significant (p>0.05). And no significant difference was observed between the number of men and women in the two groups, and this ratio was statistically the same in the control and experimental groups (Table 2). The results show that there was no statistically significant difference between the mean of the test and control groups before the intervention in the pain score of patients with breast cancer (P=0.8). There was also a significant difference between the breast cancer pain score in the control group and the test group after the intervention (P=0.001). It was also observed that the scores before and after the intervention in the test group had a significant difference, and the average pain of patients with breast cancer after the intervention was significantly lower than before the intervention (P=0.0001) (Table 3). The mean score of feeling of comfort before the intervention in the two test and control groups did not differ significantly and had the same mean statistically (P=0.61). Between the scores of comfort and convenience before and after the intervention in the test group, the mean score of comfort and convenience increased in the test group after the intervention, and this increase was statistically significant (P=0.0001). The mean values observed in the two groups according to the above table did not differ significantly; that is, there was no significant difference observed before and after the intervention in the control group (P=0.07). Also, the difference between the mean comfort and convenience of patients with breast cancer pain after the intervention in the control and test groups is significant, and there was a statistically significant difference observed between the two groups after the intervention (P=0.000) (Table 4).

Table 1- Mean and variance of age and chemotherapy in the two study groups and comparison of their means

Variable		Mean	Standard Deviation	t	P value
Age	Control	44.02	1.29	1.16	0.11
	Intervention	46.00	1.09		
Duration of Chemotherapy(years)	Control	5.31	2.35	0.282	0.7
	Intervention	5.15	2.36		

Table 2- Examination of education level and gender in the two study groups and their comparison

Variable		Control	Intervention	X^2	P value
Education level	Illiterate	9	10	2.4	0.6
	Cycle	10	11		
	Diploma	8	12		
	Postgraduate diploma	7	6		
	Bachelor's degree	11	6		
Gender	Female	43	44	0.34	0.7
	Male	2	1		

Table 3- Determination and comparison of the mean pain score of patients with breast cancer in the experimental and control groups before and after the intervention

Pain questionnaire	Control	Intervention	T	P value
Pre-Intervention	41.2 ± 12.69	42 ± 12.99	-0.26	0.8
Post-Intervention	41.85 ± 12.89	30.77 ± 6.11	5.22	0.0001
T	-2.6	5.29		
P value	0.2	0.0001		

Table 4- Determination and comparison of the average comfort score of patients with breast cancer in the experimental and control groups before and after the intervention

Feeling comfortable	Control	Intervention	T	P value
Pre-Intervention	75.73 ± 4.09	75.2 ± 4.3	0.328	0.61
Post-Intervention	76.22 ± 4.42	101.95 ± 5.16	25.2	0.000
T	-1.8	26.1		
P value	0.07	0.0001		

Discussion

The present study was conducted to determine the effect of virtual reality intervention on pain caused by chemotherapy in patients with breast cancer and also to determine the comfort of these patients in the chemotherapy ward of Khatam Al-Anbiya Hospital in Zahedan. The results show that there was a significant difference between the breast cancer pain score in the control and test groups after the intervention. Also, the average comfort and convenience score after the intervention in the test group had a statistically significant increase.

In the present study, it was observed that the average pain score of patients with breast cancer after the intervention in the two test and control groups had a significant difference. In line with the results of the present study, the study by Li et al. (2011) showed that virtual reality showed less pain in the test group than in the control group [10]. Since in this technology, people experience a noticeable increase in physical and bodily ability while performing physical movements (according to the patients themselves), the person's positive self-concept becomes stronger than before and becomes more resistant to some movement problems and discomfort and pain (which are caused by chemotherapy due to the disease), and psychologically, it also puts the person in a good position and has appropriate physiological reactions to face and deal with stress, depression, or anxiety. On the other hand, it can be inferred that the greater preoccupation and involvement of patients does not allow them to think more about the disease and the problems that have arisen, and this may be one of the reasons for the reduction in depression in these patients. On the other hand, by performing physical activities, the amount of dopamine released in the brain increases [13]. Therefore, this makes it possible for the person's thoughts to be prevented from paying attention to pain, and subsequently the brain can prevent the transmission of pain by activating parts.

Also, according to the findings, there was no significant difference in the mean pain score changes after the intervention compared to before in the control group, but in the test group, the changes were statistically significant. One of the reasons for this conclusion was the decrease in the mean pain score in the test group before and after the intervention, as well as the lack of difference in the control group.

On the other hand, the mean score of patients' sense of comfort before the intervention in the control and test groups did not differ significantly, and the mean score of patients' sense of comfort before and after the intervention in the test group had a significant difference, with the mean of the test group before the intervention being 75.2 and this number after the intervention being 101.95. In line with the results of the present study, the results of the study by Shafipour et al. (2012) aimed at understanding cardiac surgery patients' comfort sources showed that providing patients with physical comfort and relaxation areas by nurses improved nursing care and improved professional performance, and patients who were in a simulated environment had a higher comfort and relaxation score than those who underwent surgery without simulation [14]. Also, Gold et al. (2015) showed that virtual reality significantly reduced stress and anxiety scores and significantly increased comfort and relaxation scores [15].

Among the main reasons for the positive impact of this technology is the new and exciting visual and auditory nature and simulations that the patient, knowing that this is a virtual environment, tries to adapt to it by being in it and establish constructive interaction, removing the limitations of the real world from the patient and revealing new horizons to him. The interesting and engaging graphic and interactive features of this technology lead to the arousal and excitement of patients and use the individual's capabilities in a challenging format by creating appropriate motivation for a while. Some research suggests that this technology, along with relaxation techniques, plays a significant role in improving anxiety symptoms [16].

In the present study, there was no significant difference in the mean pain score of breast cancer patients before and after the intervention in the control group. The mean score before the intervention was 41.1, and after the intervention, it was 42.1, which was not statistically significant. In a study conducted by Snyder et al. (2010) on children (7-10 years old) during chemotherapy using virtual reality and without it, 82% of the children stated that the treatment using virtual reality was better than the previous method and also had a greater desire to use this technology in future treatment sessions. According to the present results, it was found that there was no significant difference between the pain score in the control group

before and after the intervention, and it was also observed that virtual reality helps significantly in reducing chemotherapy pain [17]. One of the reasons for the lack of difference in the pain score in the control group before and after the intervention is due to the lack of use of virtual reality because the person neither gains experience of chemotherapy nor has a prior perspective, and therefore the stress of chemotherapy does not change in the person.

Also, there was no significant difference in the mean comfort score of patients before and after the intervention in the control group (p=0.07). The mean comfort score in the control group before the intervention was 75.73, and this number was 76.22 after the intervention. The comfort score of patients after the intervention in the two control and experimental groups was significantly different, and the mean score for the experimental group was 101.95 and 76.22, which was statistically significant. According to the results of the present study, Rekshab and colleagues created another game for breast cancer in which each player is responsible for managing 4 breast cancer patients. In the game, the patient's history is displayed, and the player can request diagnostic tests such as ultrasound and mammography. The goal of this game is to adequately and successfully manage all 4 patients. 33 students were evaluated after playing the game, and the findings showed that the results of the true/false tests before and after the game improved significantly and had a successful effect on reducing stress and increasing pupil confidence [18].

Conclusion

Virtual reality was introduced simultaneously with the creation of user interfaces, high-speed processing, and powerful graphics. Virtual reality technology and video games can play a role in creating simulated, motivating, interactive, and realistic environments that can motivate and make health care more effective. The results of studies show that the use of virtual reality technology as an auxiliary tool to improve education, treatment, and prevention in the field of health is increasing day by day. Also, given the expansion of mobile and tablet technology and its capabilities, virtual reality and games based on it will be more effective and practical [19].

Since in this study, considering the pain scores in the control group and the post-intervention test, as well as the pain scores in the pre- and post-intervention test groups, we conclude that virtual reality has an effective role in controlling and reducing the pain of chemotherapy, which indicates the effectiveness of virtual reality in reducing pain in chemotherapy patients. In the field of comfort, considering the scores obtained in the control group and the post-intervention test, it was shown that virtual reality is an effective tool for increasing comfort and convenience in patients.

Acknowledgment

This article is part of a thesis for a master's degree in emergency nursing. We would like to express our gratitude to the respected authorities of Zahedan, the authorities, and all participating patients, without whose cooperation and assistance this research would not have been possible.

Ethical code

IR.BUMS.IREC.1398.331

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