An experimental study to assess the effectiveness of Virtual Reality Therapy upon symptomatic distress among cancer patients in a selected hospital, Chennai

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Abstract

Background: Most countries experience an ominous health transition with the rapidly rising burden of non communicable diseases. Cancer is such a disease that causes massive amount of physical and psychological stress for patients and their families. Virtual Reality (VR) therapy is a new technology in the field of medical treatment. Aims and objectives: The study aimed to assess the effectiveness of VR therapy upon symptomatic distress among cancer patients.

Methodology: An experimental study was conducted among 60 patients diagnosed with cancer-stage II chosen by purposive sampling. Thirty patients were randomized to the experimental group and 30 patients were randomized to the control group. Pain was assessed using Mc Caffery Numeric pain rating scale and stress was assessed using Cohen’s perceived stress scale. Results: The comparison of posttest scores of pain in the control group (M=6.16, SD=2.93) and experimental group (M=1.6, SD=1.76) of cancer patients showed a statistically significant difference with a ‘t’ value of 7.40 at p<0.01. The comparison of post test scores of stress among cancer patients in the control group (M=26.23, SD=7.00) and experimental group (M=3.32, SD=2.77) showed a statistically significant difference with a ‘t’ value of 2.77 at p<0.001. The study findings revealed a significant reduction in stress and pain in the experimental group post therapy, which may be attributed to the effectiveness of VR therapy.

Key words: Symptomatic distress, cancer, pain, stress, Virtual reality therapy.
I. Introduction

Cancer is a single term denoting a group of diseases. Most cancer patients and their families face various physical and psychological setbacks during their life, some of which may challenge the coping resources of the patients. The World Cancer Research Fund International Organization has mentioned that the age-standardized rate for all cancers excluding non-melanoma skin cancer for men and women combined was 182 per 100,000 in 2012. ICNR in New Delhi have forecasted arise in the number of breast, lung and cervical cancers in India with an overall 17.3 lakh new cases by 2020. The Northeastern part of the country is more affected with cancer, Aizawl being the highest in number.

Emotions are integral to the understanding, assessment, and treatment of persistent pain. Pain is often treated as a purely sensory experience reflecting underlying tissue damage. Stress is a complex process including environmental and psychosocial factors that initiate a cascade of information processing in both the peripheral nervous system and CNS. People who have cancer may find the physical, emotional, and social effects of the disease to be stressful. Evidence from experimental studies does suggest that psychological stress can affect a tumor's ability to grow and spread. Emotional and social support can help patients learn to cope with psychological stress.

Over the last few years there has been mounting concern about the need for multidimensional treatment modalities for cancer in every setup. Virtual Reality Therapy is a novel element of therapy that helps patients of diverse medical surgical chronic conditions to deal with their psychological stress and thereby, directly affecting certain physical factors. Emotional and social support can reduce levels of depression, anxiety, and disease and treatment-related symptoms among patients. Therefore, the present investigators have carried out the experimental study to assess the effectiveness of VR therapy upon symptomatic distress among cancer patients.

Objective of the study

1. To assess the level of pain and stress among control and experimental group of cancer patients before and after the virtual reality therapy.

Null Hypothesis

NH$_1$: There will be no significant difference in pretest and posttest scores of pain and stress in control and experimental group of cancer patients.

II Materials and methods

The present study was done using a Quasi Experimental pretest posttest research design. A total of 60 patients, aged above 20 years and diagnosed with cancer stage II or above were selected using purposive sampling technique. Patients having head and neck cancer and those who did not have smart phones were excluded as the therapy was given using Cardboard goggles and mobile downloaded applications on VR.
The various tools used were Demographic and Clinical variable proforma for patients. Pain was assessed using McCaffery, Beebe et al. 10 point Numeric Pain Rating Scale and stress was assessed using Cohen’s et al’s Perceived Stress Scale (PSS). Satisfaction was assessed using a rating scale.

Data was collected first among the control group, followed by the experimental group. Pre test assessment of pain and stress was done for the control group and post test was done after 3 days of regular treatment. Then in the experimental group, pretest of pain and stress was conducted, following which Virtual Reality Therapy was given for 15-20 minutes for 3 consecutive days after which a posttest of pain and stress was done using the same tools and the rating scale on satisfaction on Virtual Reality Therapy.

Ethical clearance was obtained from the Institutional Ethical committee of Apollo Hospitals group. Permission to conduct the study in the selected Hospitals, Chennai was obtained from the concerned authorities. Informed consent was obtained. The confidentiality and anonymity of information about study participants was assured and maintained. Debriefing was done for all study participants every day at the end of intervention. Descriptive and inferential statistics were used.

III Results

Demographic data of the patients revealed that 36.66% in the control group were in the age group of 30-40 years and 33.33% in the experimental group were aged between 50-60 years. Males comprised a significant proportion-56.66% and 37% respectively; clinical data revealed that many of the cancer patients, 43.33% and 53.33% were hospitalized 1-2 times within the last five years in the control and experimental group respectively and 93.33% of the cancer patients in both groups had never used any stress relaxation therapy before.
Fig 1: Percentage Distribution of Duration of Medical Illness among Control and Experimental Group of Cancer Patients

![Percentage Distribution of Duration of Medical Illness](image1)

Fig 2: Percentage Distribution of Pretest Level of Stress in Experimental and Control Group

![Percentage Distribution of Pretest Level of Stress](image2)
Fig 3: Percentage Distribution of Posttest Level of Stress in Experimental and Control Group

Fig 4: Percentage Distribution of Level of Satisfaction with Virtual Reality Therapy in the Experimental Group

The above figures 1 to 3 reveal that the stress level was high (50%, 66.6%) in the control group both before and after the therapy, whereas in the experimental group, 73.3% had high stress before therapy and 60% had low levels of stress after therapy. The experimental group also reported a high level of satisfaction with the VR therapy.

Table 1: Comparison of Mean and Standard Deviation of Pretest and Posttest Score of Pain and Stress in Control and Experimental Group of Cancer Patients

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Student independent ‘t’ test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control group (n=30)</td>
<td>Experimental group (n=30)</td>
<td></td>
</tr>
<tr>
<td>Pain</td>
<td>Mean: 6.36, SD: 2.23</td>
<td>Mean: 6.5, SD: 2.09</td>
<td>Mean: 6.16, SD: 2.93</td>
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<td></td>
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<td>Student independent ‘t’ test</td>
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<tr>
<td>Stress</td>
<td>Mean: 25.4, SD: 8.17</td>
<td>Mean: 25.9, SD: 7.54</td>
<td>Mean: 26.23, SD: 7.00</td>
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***P<0.001 NS- Not significant  S-Significant

The data presented in table-1 depicts the comparison of pretest and posttest scores between the experimental and control group. Analysis between posttest scores of pain in the control group (M=6.16, SD=2.93) and experimental group (M=1.6, SD=1.76) showed a statistically significant difference for ‘t’ value of 7.40 at p<0.001.

The comparison between posttest stress scores in the control group (M=26.23, SD=7.00) and experimental group (M=3.32, SD=2.77) also showed a statistically significant
difference for 't' value of 2.77 at p<0.001 which may be attributed to the effectiveness of VR therapy.

IV Discussion

In the present study, both the control and experimental group of cancer patients had shown a significant amount of stress and pain during the time of regular treatment but there was a remarkable change in both stress and pain of the experimental group of cancer patients after the Virtual reality therapy. The use of VR therapy by the patients had resulted in diminution of pain or other physical and psychological distress. Researchers hypothesized that VR therapy has a non-pharmacologic analgesic effect which directly affects the emotional affective, emotion-based cognitive processes on the body’s intricate pain modulation system[5].

Demographic variables

The demographic data shows that cancer is not gender specific and that middle aged and older adults are the group suffering mostly from cancer, though the 2012 census analysis by Cancer Research Fund International Organization have found men to be affected more worldwide with cancer (205 per 100,000) than women (165 per 100,000) with a highest rate in France (385 men per 100,000)[1]. Moreover with advancing age, the severity of the disease can lead to profound stress and amplify the psychological pain of the patients.

Clinical variables

The physiological stress response can be triggered by psychosocial factors which may have a direct effect on cancer progression. The overall stress response involves activation of several body systems including the autonomic nervous system and the hypothalamic–pituitary–adrenal (HPA) axis[6].

The investigators found that the majority of cancer patients in both groups (73.33% in the control group and 76% in the experimental group) were suffering for 1-5 years from cancer and a majority of them (93.33%, 93.33%) had never used any stress relaxation therapy before. The study findings also revealed that more than half of the patients in both groups (56.66%, 50%) were undergoing a neo adjuvant treatment approach. This result finds support in the study findings by Razali et. al (2008), that stress was higher in groups receiving neo adjuvant therapy for cancer[7]. Progression of cancer and its treatment can lead to the development of multiple symptoms in the life of cancer patients including fatigue, pain, stress and alteration in functional status of the client[8]. The issue of symptomatic distress is either neglected or ignored in many setups.

Stress

The study has found high levels of stress (50%, 73.33%) in both control and experimental group of patients before the therapy. Even after regular treatment, stress levels remained high (66.66%) in the control group but reduced to low levels of stress (66.66%) in the experimental group. The findings found a strong positive correlation between pain and stress (r= 0.79) in the control group and weak positive relation (r= 0.02) for the experimental group after therapy.

The human body responds to stressors by activating the nervous system and specific hormones. Pain can be due to disease-related factors (abdominal pain, visceral pain, nerve compression) or treatment-related factors (chemotherapy, radiation therapy and surgery) or may be related to patient-related factors (social or spiritual pain). Gold et al. hypothesized
that the analgesic effect of VR develops from an inter-cortical modulation between various pain signaling pathways through auditory, visual or touch senses. So, the action of anterior cingulate will increase, when there is a decrease in the pain level. The function of brain’s orbito-frontal region i.e. regulation of emotion, decision-making process and also regulation of vital functions, will alter due to immersive VR \[9\]

Pain

The present findings have shown a high level of pain (43.3%, 60%) both in control and experimental group of cancer patients before the therapy; but after three days of regular treatment, 40% continued to suffer with severe pain in the control group and 0% had severe pain after virtual reality therapy in the experimental group.

Pain and stress are correlated. Pain is common in cancer patients and is related to significant psychological and physical impairment. A study by Nuhu (2009) et al. found that the presence of pain was significantly associated with depressive and anxiety symptoms and poor overall quality of life. \[10\]. Another study by Xiao et al. (2017) on psychological distress and cancer pain among Chinese patients had found that patients who reported pain (64) had more anxiety and depression (BDI mean 19.17) compared to those who did not report any pain (62) with a mean BDI score of 15.35. \[11\]

V. Conclusion

Though the chronic aggravating physical symptoms are the major factors for pain in cancer patients, the psychological and social factors are also of equal importance. Inadequate levels of knowledge of the medical care personnel and especially, the inability to assess the pain severity, is one of the main factors in pain management. Virtual reality therapy using Cardboard goggle and Mobile VR applications is useful in reducing pain and stress among cancer patients and can be incorporated in the conventional care and practice.

VI. References


M41-kJvP EAg6IAwM&v=1&r=https://www.researchgate.net/publication/224966833 _Life_Event_Stress_and_Illness&p=DevEx.LB.1,5543.1


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VIII. Conflict of Interest: None

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X Contributors:

**DD:** Conceptualization of the study, collection, analysis of the data, writing the manuscript, and finalized the manuscript will act as the guarantor of the paper; **JG:** Conceptualization of the study, writing the manuscript, finalized the manuscript; **LV:** Edited and critically evaluated the manuscript.

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