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COMPARATIVE STUDY TO ASSESS THE EFFECTIVENESS OF VIRTUAL REALITY VERSUS DIGITAL TRUE-LIFE EXPERIENCES ON ANXIETY AND CLINICAL PARAMETERS AMONG PATIENTS UNDERGOING MASTECTOMY

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ABSTRACT

Cancer, a major global health issue, encompasses a wide range of diseases characterized by the uncontrolled growth and spread of abnormal cells. It poses a great threat to human health, affecting millions of people worldwide and causing immense physical, emotional, and economic burdens. The study aimed to assess the effectiveness of virtual reality intervention versus digital true-life experience on anxiety and clinical parameters among patients undergoing mastectomy. A total of 60 patients participated in the study, with 20 in Experimental Group I, 20 in Experimental Group II, and 20 in the Control Group. Participants were selected through a non-probability purposive sampling technique. Virtual reality intervention was given to experimental group I for 15 minutes 2 hours before the surgery and experimental group II received digital storytelling for 15 minutes 16 hours before the surgery. Data collection involved gathering demographic information using a structured interview schedule, measuring anxiety levels with a visual analog scale for anxiety, and assessing clinical parameters by bio-physiological measurements. The collected data were analyzed using descriptive and inferential statistics. The results of the study revealed that the mean anxiety scores before the intervention between experimental group I, experimental group II, and the control group, by the ANOVA value ($F = 0.740$, $P = 0.482$) and post hoc analysis ($P > 0.05$). While after the intervention, the ANOVA value ($F = 45.980$, $P = 0.000$) indicated a highly significant difference in anxiety scores between the groups ($P < 0.05$). Post hoc analysis showed no significant difference between experimental groups I and II

(mean difference = 0.550, P = 0.059), but significant differences were found between experimental groups and the control group (P = 0.000). The findings confirmed that both virtual reality and digital storytelling interventions were equally effective in significantly reducing anxiety among patients undergoing mastectomy. Also, in the clinical parameters before the intervention, all groups had more or less similar values. After the intervention, the experimental groups showed clear improvements, including lower blood pressure, slower heart and breathing rates, and better oxygen levels. In contrast, the control group's parameters worsened, with higher blood pressure, faster heart and breathing rates, and no improvement in oxygen levels, which underscores virtual reality and digital storytelling interventions effectively improve clinical outcomes. These low-cost, practical methods are valuable for managing anxiety and supporting better outcomes. Digital storytelling showed a longer-lasting effect, while virtual reality provided quicker results. The findings also emphasize in promoting the use of these cost-effective methods in pre-operative care for mastectomy patients.
Keywords: Virtual reality intervention, Digital true-life experience, Anxiety, Clinical parameters, mastectomy patients

INTRODUCTION

Cancer remains a significant societal, public health, and economic challenge in the 21st century, accounting for nearly one in six deaths (16.8%) globally and over one in four deaths (22.8%) from non-communicable diseases (NCDs). According to the World Health Organization (WHO) report of 2023, approximately 734,000 individuals are diagnosed with cancer annually, with this number projected to rise by about 50% by 2040. India bears a substantial cancer burden, particularly breast cancer, which accounted for an estimated 98,337 deaths in 2022. The Madras Metropolitan Tumor Registry at the Cancer Institute, Adyar, highlights a 7% increase in breast cancer incidence among women in Chennai over the past 15 years (Times of India, November 2, 2023).

Surgery is the cornerstone of breast cancer treatment, encompassing procedures such as mastectomy, lumpectomy, and breast reconstruction. However, preoperative distress and anxiety are prevalent among patients undergoing breast cancer surgeries, significantly influencing perioperative outcomes. Managing this anxiety is critical to improving the overall experience and recovery of patients.

Interventions to alleviate preoperative anxiety include exercise, yoga, mindfulness meditation, music therapy, education, and innovative distraction techniques such as virtual reality (VR), social platforms like WeChat, and exposure to the true-life experiences of cancer survivors. These emerging strategies are gaining attention for their potential to enhance emotional well-being and clinical outcomes, underscoring the importance of effective approaches to anxiety management in patients undergoing mastectomy.

STATEMENT OF THE PROBLEM

A comparative study to assess the effectiveness of virtual reality versus digital true-life experiences on anxiety and clinical parameters among patients undergoing mastectomy in a selected hospital at Coimbatore.

OBJECTIVES

- To assess and compare the level of anxiety before and after interventions in experimental group I (virtual reality intervention), experimental group II (digital true life experience), and the control group.

- To compare and evaluate the effectiveness of virtual reality intervention vs digital true life experience on anxiety in the experimental group I and II before and after intervention.
- To assess and compare the clinical parameters before and after interventions in experimental group I (virtual reality intervention), experimental group II (digital true life experience), and control group.
- To associate the selected demographic variables with the level of anxiety among patients undergoing mastectomy before intervention in experimental groups I, II and in the control group.

HYPOTHESIS

- **H_1:** There will be a significant difference in the mean anxiety score before and after intervention in the experimental group I, experimental group II, and control group.
- **H_2:** There will be a significant difference in the mean anxiety score after intervention between experimental group I, experimental group II, and the control group.
- **H_3**: There will be a significant difference in the mean score of clinical parameters (blood pressure, heart rate, respiratory rate, and oxygen saturation) before and after intervention in the experimental group I, experimental group II, and control group.

OPERATIONAL DEFINITION

Virtual Reality Intervention: It refers to creating an environment with natural sceneries that enables a person to immerse in a 3-D visual environment for 15 minutes prior (2 hours) to surgery.

Digital true-life experience: It refers to the recorded videos of the real experience of 8 post-mastectomy clients that are presented to the patients undergoing mastectomy on the previous day of (16 hours prior) surgery for 15 minutes through mobile.

Anxiety: It refers to the subjective feelings of fear, doubt, worry, or unease about the upcoming mastectomy procedure among breast cancer patients and is measured using the Visual Anxiety Scale.

ASSUMPTION

Anxiety is an unavoidable and unpleasant state of tension experienced by patients undergoing mastectomy surgery.

DELIMITATION

The study was delimited to

- The study was conducted only in selected hospitals
- The study was focused on adult female patients in the age group of 30-70 years.

METHODOLOGY

Research approach: Quantitative evaluative research approach

Research design: Quasi-experimental pre-test and post-test design.

Population: Breast cancer patients undergoing mastectomy surgery(30-70 yrs)

Sample: 60 women with breast cancer undergoing mastectomy (20 in the experimental group I, 20 in experimental group II, and 20 in the control group)

Sampling technique: A non-probability purposive sampling technique was used to select the samples.

Sampling Criteria:

All breast cancer patients

- Who were female and of any age group
- Who were undergoing mastectomy surgery for the first time
- Who were willing to participate in the study
- Who could read or understand Tamil or English
- Who did not have a history of neurological impairments (such as motor, visual, and auditory disabilities) or psychological disorders

- Who was medically stable

Data collection method:

Interview technique, bio-physiological methods, and observation techniques were used.

Validity and Reliability:

Tool validity was ensured through experts' feedback and reliability established by the inter-rater method with an r-value of 0.87.

ETHICAL CONSIDERATIONS

The study was approved by the Institutional Ethical Committee, with written permission from authorities. Participants gave verbal consent, ensured confidentiality, and were provided privacy and comfort throughout the study.

RESULTS

The demographic analysis revealed that 30-35% of patients in experimental groups I and II and 20% in the control group were aged 40-50 years. Most patients across all groups had primary school education (30-40%), were married (75-95%), Hindu (75-95%), and non-vegetarians (70-85%). About 40-50% in experimental groups and 75% in the control group were housewives, and 50-60% belonged to nuclear families. Nearly half of the patients (40-45%) had an income between ₹10,000-₹15,000, and 60-70% had two children. Pre-existing co-morbidities, such as diabetes and hypertension, were present in 20-30% of patients, with high medication adherence. Most were diagnosed with breast cancer within one month (45-55%), and family history was rare (5%). Media was the main source of breast cancer information (45-60%), and common symptoms included a breast mass (30-40%), pain (35-65%), and weight loss (45-50%). All patients had breastfed their children, with the majority breastfeeding for 6-12 months. None had used oral contraceptive pills, and most were postmenopausal (65-80%).

Group	Mean	SD	ANOVA value df = 2, 57	Sig value
Before Intervention				
Experimental group-I	8.30	1.174	F = 0.740	0.482 NS
Experimental group-II	8.05	0.826		
Control group	7.95	0.759		
After Intervention				
Experimental group-I	5.85	1.040	F = 45.980	0.000 *
Experimental group-II	5.30	0.865		
Control group	8.40	0.754		

SD - Standard deviation, df =Degrees of Freedom, NS- Not Significant at P<0.05, * Significant at P<0.05

Table 1 presents the comparison of mean anxiety scores between experimental groups I, II and the control group before and after the intervention

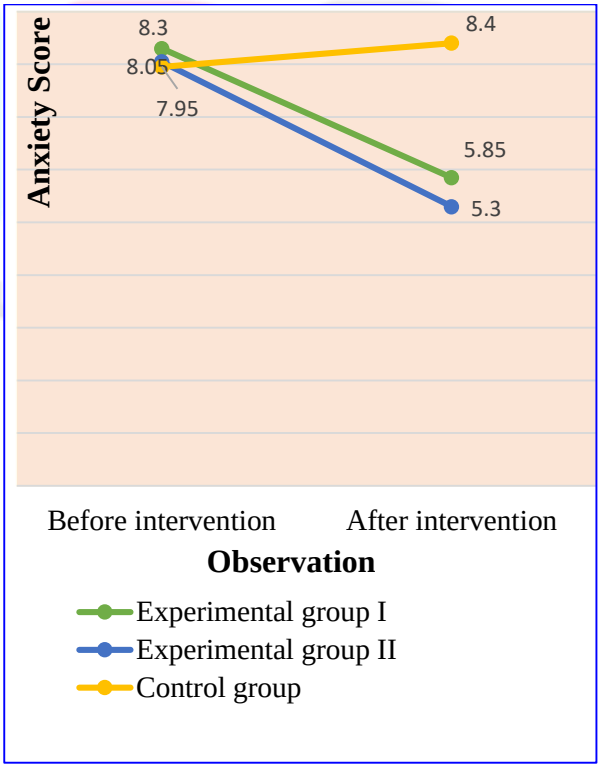

Figure 1 presents the mean anxiety score before and after intervention in the experimental groups I, II and in control group.

Hence the hypothesis, H_1: There was a significant difference in the mean anxiety score before and after intervention in the experimental group I, experimental group II and control group, was accepted.

Also, the hypothesis, H_2: There was a significant difference in the mean anxiety score after intervention between the experimental groups I, II and control group (F=45.98, df=58, P=0.000), was accepted.

There was a significant association between the level of anxiety and duration of diagnosis of breast cancer (Chi-square=7.177, P=0.028, df=2).

The study compared clinical parameters across two experimental groups and a control group before and after the intervention. Prior to the intervention, the groups had similar baseline values. Post-intervention, significant improvements were observed in both experimental groups, with reduced systolic and diastolic blood pressure, decreased heart and respiratory rates, and improved oxygen saturation. In contrast, the control group showed worsening parameters, including increased blood pressure, heart and respiratory rates, with no improvement in oxygen saturation. There was a significant difference in the mean score of clinical parameters (blood pressure - systolic blood pressure: t-value = 8.659, diastolic blood pressure: t-value = 7.092, df = 19, P = 0.000, heart rate : t-value = 5.729, df = 19, P = 0.000, respiratory rate : t-value = 7.377, df = 19, P = 0.000, and Spo2 : t-value = 3.655, df = 19, P = 0.002) before and after intervention in the experimental group I. Also, there was a significant difference (decreased) in the mean score of clinical parameters (blood pressure-systolic blood pressure: t-value = 6.882, diastolic blood pressure: t-value =8.919, df = 19, P = 0.000, heart rate : t-value = 8.151, df = 19, P = 0.000), respiratory rate : t-value = 11.544, df = 19, P = 0.000, and Spo2 : t-value = 3.488, df = 19, P = 0.002) before and after intervention in the experimental group II. Where as in the control group, there was a significant difference (increased)in the mean score of clinical parameters (blood pressure-systolic blood pressure: t-value = 5.107, diastolic blood pressure: t-value = 4.296, df = 19, P = 0.000, heart rate : t-value = 12.329, df = 19, P = 0.000, and respiratory rate : t-value = 4.172, df = 19, P = 0.001) before and after intervention. These results demonstrate the effectiveness of virtual reality and digital storytelling interventions in improving clinical outcomes.

DISCUSSION

The present study findings were supported by the study conducted by **Pak Lung Chiu, DN, RN et al., (2023)** to find out the effectiveness of a VR-based intervention in reducing preoperative anxiety among adult patients undergoing elective surgery. In their study, compared with the control group, the VR-based intervention group showed significantly decreased preoperative anxiety at T1 (β, −5.46; 95% CI, −7.60 to −3.32; P < .001) and T2 (β, −5.57; 95% CI, −7.73 to −3.41; P < .001), lower stress at T1 (β, −10.68; 95% CI, −16.00 to −5.36; P < .001) and T2 (β, −5.16; 95% CI, −9.87 to −0.45; P = .03), and higher preparedness at T1 (β, 6.60; 95% CI, 0.97 to 12.19; P = .02). Satisfaction levels were significantly increased in the intervention group vs the control group (mean [SD] score, 81.35 [9.24] vs 65.28 [8.16]; difference, 16.07; 95% CI, 12.00 to 20.15; P < .001). No significant differences in pain and postoperative length of stay were found. The

findings of this study suggest that a VR-based intervention is a feasible and effective way to reduce preoperative anxiety in adult patients undergoing elective surgery. Also, the study findings were supported by **R.E.Gabalawy's (2024)** study to find out the effectiveness of an immersive virtual reality intervention for preoperative anxiety and distress among adults undergoing oncological surgery. In their study, they found out that virtual reality has the potential to reduce pre operative state anxiety for a large number of samples and yield better postoperative health outcome.

CONCLUSION

The findings of the study concluded that both virtual reality intervention and digital storytelling interventions were effective in reducing anxiety and improving clinical parameters. The study also found a notable association between the duration of breast cancer diagnosis and anxiety levels, highlighting the importance of early and continuous psychological support. The study underscores that both interventions were equally effective and proved to be valuable tools in enhancing patient care during the mastectomy process, while digital storytelling intervention (provided 16 hours before the mastectomy procedure) proves a long-term effect than virtual reality intervention (provided before 2 hours of mastectomy procedure).

LIMITATION

- The study was limited to a small sample size, which will restrict the generalizability of the findings
- The samples were selected using a purposive sampling technique, affecting the representativeness of the sample
- Hospital environment and procedural practices make bias in anxiety outcomes.

IMPLICATION

This study has significant implications across nursing practice, education, administration, and research. In practice, nurses can incorporate virtual reality and digital storytelling interventions to help manage pre-operative anxiety in mastectomy patients, enhancing patient care. For nursing education, it is vital to include these non-pharmacological methods in curricula and provide hands-on training to equip future nurses with holistic care skills. Administrators should support these efforts by organizing training programs, integrating these methods into care protocols, and ensuring resource availability. Nurse researchers can further validate these interventions by studying diverse populations and settings, optimizing usage, and sharing insights widely to advance nursing knowledge and practice.

RECOMMENDATIONS

- A similar study can be conducted to assess post-operative outcomes, including post-operative pain and duration of hospital stay.
- A similar study can be conducted with mixed design to explore the anxiety among patients with different stages of cancer.
- A similar study can be conducted to assess the anxiety in patients undergoing others surgical procedures like orthopedic, cardiac, or gastrointestinal surgeries.
- A comparative study to assess the effect of digital story telling intervention on anxiety among patients with breast cancer and uterine cancer.

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