

Research Article

Effect of Virtual Operating Room Tour (VORT) on Pre-Operative Anxiety Among Patients Undergoing Major Surgeries

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A B S T R A C T

Introduction: The period before surgery is often associated with considerable psychological distress, causing patients to experience anxiety and stress. Elevated preoperative anxiety can negatively affect patient satisfaction and trigger neuroendocrine responses that contribute to perioperative complications. Increased anxiety may result in inadequate jaw relaxation, challenges in establishing venous access, and coughing during anesthetic induction. It can also lead to autonomic instability during surgery and contribute to greater postoperative pain, nausea, and vomiting.

Objectives: The study was aimed at assessing the level of anxiety preoperatively and finding out the effect of a virtual operating room tour on anxiety among patients undergoing major surgeries and seeking an association of preoperative anxiety with selected demographic variables.

Methodology: Quasi-experimental pre-test post-test control group design. 62 samples were enrolled by non-probability convenience sampling, which were divided into experimental and controlled groups. The pre-test was administered one day prior to surgery, and intervention was provided to the experimental group, and the post-test was taken one hour prior to surgery. In the control group, the pre-test was administered one day prior to surgery and the post-test one hour prior to surgery.

Result: The anxiety score was significantly reduced after intervention in the post-test. In the pre-test, there was no significant difference in anxiety score between the experiment and control groups, while in the post-test, the anxiety score was significantly lower in the experiment group than in the control group. There was a significant association of pre-test anxiety score and gender in the experiment group; females had more anxiety than males, and there was no significant association of pre-test anxiety score and gender in the control group.

Conclusion: A Virtual Operating Room Tour (VORT) was effective in improving pre-operative anxiety in patients undergoing major surgeries.

Keywords: Virtual Operating Room Tour, Pre-Operative Anxiety, Major Surgeries, Preoperative Care, Intraoperative Care, Postoperative Care

Introduction

Anxiety is an emotional response characterized by feelings of fear, apprehension, and uneasiness that commonly arise in stressful or potentially threatening situations.¹ Preoperative anxiety imposes stress and dissatisfaction in surgical patients, which triggers neuroendocrine changes that adversely influence perioperative and postoperative outcomes. Preoperative anxiety is associated with an altered and changed neuroendocrine response that may contribute to postoperative complications and delayed recovery. Anxiety and depressive symptoms experienced preoperatively are linked to lower satisfaction with surgical outcomes. Patients with high levels of preoperative anxiety may experience difficulties such as delayed jaw relaxation, challenging venous access, and coughing during anesthetic induction. During surgery, anxiety can lead to autonomic instability, while in the postoperative period it may result in increased pain perception, nausea, vomiting, greater anesthetic requirements, prolonged recovery times, and extended hospital stays.² Anxiety may occur as a temporary emotional state in response to specific situations or as a more enduring personality trait characterized by a tendency to react with anxiety across various circumstances. It may also be a symptom associated with several psychological disorders, including depression and post-traumatic stress disorder. Certain population groups are more vulnerable to anxiety disorders, particularly children, adolescents, and women, with women demonstrating a higher prevalence of anxiety-related conditions compared to men.³ During the preoperative period, patients frequently encounter uncertainty regarding the surgical procedure, anesthesia, possible complications, and recovery, which may contribute to heightened anxiety. Several factors influence the development and severity of preoperative anxiety. These include sociodemographic characteristics such as age, gender, education, and socioeconomic status; psychological factors such as coping abilities and previous emotional experiences; and surgery-related factors including prior surgical experiences, type of surgery, anesthesia concerns, and the extent of information provided regarding the surgical procedure. Understanding and addressing these factors are essential for developing effective interventions aimed at reducing preoperative anxiety and improving surgical outcomes.⁴

Need of the study

Anxiety is a mental health condition marked by excessive and persistent fear that exceeds what is considered a normal response to a given situation. Existing evidence suggests that preoperative assessment and management of anxiety and depression are essential for minimizing patient dissatisfaction and enhancing perioperative outcomes.⁵ Palmira Oliveria et al. (2022) proved in their study that psychoeducation programs can be useful and effective in reducing anxiety.⁶ A da Baytar et al. (2021) conducted a study on the effect of virtual reality on preoperative anxiety in patients undergoing septorhinoplasty. The result shows median anxiety scores decreased significantly from 40.5 to 34, and virtual reality has a positive effect on hemodynamic parameters in the patients undergoing septorhinoplasty.⁷ Marilia F. Lemos et al. conducted a study to investigate the effect of preoperative education about their scheduled anesthetic and surgical procedure on the level of anxiety of cancer subjects undergoing surgery among experimental and control groups. The result shows that hemodynamic values were lower in the experimental group compared to the control group. The conclusion of the study shows patient orientation in the preoperative setting should be the standard of care to minimize the patient's anxiety before surgery.⁸ Most of the previous studies have shown how anxiety affects the individual in their preoperative as well as in the postoperative period. So, the interventions are needed to reduce preoperative anxiety in patients. Nurses can educate the patients undergoing major surgeries via a virtual operating room tour to reduce their preoperative anxiety, which can alter the post-operative outcome. Nurses are in an excellent position to assess the preoperative anxiety and improve the postoperative outcome by providing education and real-life experiences to the patients undergoing major surgeries. Therefore, the current study was taken up to assess the level of anxiety preoperatively, to find out the effect of a virtual operating room tour on anxiety among patients undergoing major surgeries, and to seek an association of preoperative anxiety with selected demographic variables.

Methods

62 patients undergoing major surgeries (31 in each group, i.e., experimental and control group) were selected from 16/4/2023 to 26/5/2023. Patients who were above 18 years, able to understand Marathi/English, undergoing major surgeries, and patients with normal hearing and visual acuity were included in the study. Data was collected using a structured questionnaire to assess demographic variables and an anxiety scale to measure the level of preoperative anxiety. Section A of the tool included demographic data

of patients undergoing major surgeries. It contained a total of 6 items: age, gender, education, occupation, family income monthly, name of surgery, and type of anesthesia. Section B was an anxiety scale to measure the level of preoperative anxiety. The anxiety scale consisted of a total of 12 items for assessing the level of anxiety among patients undergoing major surgeries. Each item had four opinions, i.e., not at all, somewhat, moderate, and extremely. The maximum obtained score of response for preoperative anxiety was.⁴⁸ The validity of the rating scale was established in consultation with experts. It was validated by 12 experts in the fields of nursing, clinical specialty, and statistics. To assess the level of preoperative anxiety among patients undergoing major surgeries, the score of the anxiety scale is grouped into categories like mild, moderate, and severe anxiety score according to the tertile range method. The Cronbach Alpha test was used to assess the reliability of the tool. The reliability of the tool is 0.804, which confirmed the reliability of the tool.

Approval was obtained from the Institutional Ethics Committee, permission from the authorities of the hospital, and written informed consent from all participants. The data collection process began from 16/4/2023 to 26/5/2023. Subjects who agreed to join the study were given a self-structured tool. Data analysis was done using SPSS (Statistical Package for the Social Sciences). The data analysis was planned to be set in an Excel file, and the ANOVA test, Wilcoxon Z test, and Mann-Whitney test were used. The data analysis was planned to include descriptive and inferential statistics present in the form of tables, graphs, and figures.

Results

Section I: - Patient's demographic data

In the experimental group, the majority, 12 (38.70%), of the subjects were in the age group of 31-50, followed by 10 (32.25%) in the age group up to 30, and 9 (29.03%) were in the age group of 51 and above. Males were 15 (48.38%) and females were 16 (51.61%). The majority of subjects, 20 (64.51), were graduates; 6 (19.35) were studied up to higher secondary; and 5 (16.12) were studied up to secondary. 9 (29.03%) were housewives, 8 (25.80%) were students, 6 (19.35%) subjects were servants, 4 (12.90%) subjects were farmers, and 4 (12.90%) subjects were self-employed. The majority of subjects, 12 (38.70%), had a monthly income between 20001 and 40000, followed by 10 (32.25%) who had up to 20000 and 9 (29.03%) who had 40001 and above. 17 (54.83%) subjects had general anesthesia, and 14 (45.16%) subjects had spinal anesthesia.

In the control group, the majority of subjects, 14 (45.16%), were in the age group of 51 and above, followed by 10

(32.25%) in the 31-50 years' age group and 7 (32.25%) in the age group up to 30 years. By gender, males were 17 (54.83%) and females were 14 (45.16%). Majority 23 (74.19%) were graduates, 5 (16.12%) subjects were studied up to secondary, and 3 (9.677%) subjects were studied up to the higher secondary group. 14 (45.16%) subjects were servants, 7 (22.58%) subjects were self-employed, 5 (16.12%) subjects were farmers, and 3 (9.677%) subjects were housewives. 14 (45.16%) subjects had a monthly income between 20001 and 40000, followed by 9 (29.03%) who had 40001 and above and 8 (25.80%) who had up to 20000. 16 (51.61%) subjects had general anesthesia, and 14 (45.16%) had spinal anesthesia.

Section II:- Assess The Effect of Virtual Operating Room Tour on Anxiety Among Patients Undergoing Major Surgeries in Experimental Group and Control Group

Table 2 shows level of anxiety among patients undergoing major surgeries. In experimental group in pre-test 0% subjects had mild anxiety, 11 (35.48%) had moderate anxiety and 20 (64.52%) subjects had severe anxiety. In post- test 30 (96.77%) subjects had mild anxiety, 1 (3.23%) had moderate anxiety and 0 (0%) subjects has severe anxiety. It shows, that there is reduction in severity of anxiety in post- test in experimental group.

Table 3 shows the level of anxiety among patients undergoing major surgeries in control group. In pre-test 0% patients had mild anxiety, 35.48% (11) patients had moderate anxiety and 64.52% (20) had severe anxiety. In post-test 35.48% (11) patients had mild anxiety, 58.06% (18) patients had moderate anxiety and 6.45% had severe anxiety.

Table 4 shows effect of Virtual Operating Room Tour (VORT) on anxiety among patients undergoing major surgeries in experimental group. There is significant reduction of anxiety score after Virtual Operating Room Tour in post-test in experimental group among patients undergoing major surgeries.

Table 5 shows effect of standard preoperative procedure on anxiety among patients undergoing major surgeries in control group. There was reduction of anxiety score between pre and post- test i.e. anxiety score was significantly reduced after post- test in control group.

Table 6 shows comparison of pre-test and post-test level of anxiety among patients undergoing major surgeries in experimental and control group. In pre-test, no significant difference of anxiety score between experiment and control group as $P > 0.05$ while in post- test, anxiety score was significantly less in experiment group than control group as $P < 0.0001$.

Section III: Association of preoperative anxiety with selected demographic variables

In the study there is no significant association of pre-test anxiety score and age in the experimental and control groups as $P>0.05$. In the study, there was a significant association of pre-test anxiety score and gender in the experiment group as $P=0.001$, i.e., females had more anxiety than males, and there was no significant association of pre-test anxiety score and gender in the control group as $P>0.05$. In the study there is no significant association of

pre-test anxiety score and educational qualification in the experimental and control groups as $P>0.05$. In the study there is no significant association of pre-test anxiety score and occupation in the experimental and control groups as $P>0.05$. In the study there is no significant association of pre-test anxiety score and family monthly income in the experimental and control groups as $P>0.05$. In the study there is no significant association of pre-test anxiety score and anesthesia in the experimental and control groups as $P>0.05$.

Table 1. Distribution of Patients According to Selected Socio-Demographic and Clinical Variables

n 1 + n 2 = 62						
Parameters	Parameters	Experimental group		Control Group		Total
Age (years)	Up to 30	10	32.25	7	22.58	17
	31 – 50	12	38.70	10	32.25	22
	51 & above	9	29.03	14	45.16	23
	Total	31	-	31	-	62
Gender	Male	15	48.38	17	54.83	32
	Female	16	51.61	14	45.16	30
	Total	31	-	31	-	62
Education	Secondary	5	16.12	5	16.12	10
	Higher secondary	6	19.35	3	9.677	9
	Graduate	20	64.51	23	74.19	43
	Total	31	-	31	-	62
Occupation	Housewife	9	29.03	3	9.677	12
	Farming	4	12.90	5	16.12	9
	Service	6	19.35	14	45.16	20
	Self-employed	4	12.90	7	22.58	11
	Student	8	25.80	2	6.451	10
	Total	31	-	31	-	62
Monthly income (in rupees)	Up to 20000	10	32.25	8	25.80	18
	20001 – 40000	12	38.70	14	45.16	26
	40001 & above	9	29.03	9	29.03	18
	Total	31	-	31	-	62
Type of anaesthesia	General	17	54.83	17	54.83	34
	Spinal	14	45.16	14	45.16	28
	Total	31	-	31	-	62

Table 2. Frequency and percentage of the level of anxiety among patients undergoing major surgery in experiment group

n 1 + n 2 = 62		
Level of anxiety	Pre- test frequency and %	Post- test frequency and %
12– 23 (Mild)	0	30 (96.77)
24 – 35 (Moderate)	11 (35.48)	1 (3.23)
36 – 48 (Severe)	20 (64.52)	0
Total	31 (100)	31 (100)

Table 3. Frequency and percentage of the level of anxiety among patients undergoing major surgery in control group
n 1 + n 2 = 62

Level of anxiety	Pre- test frequency and %	Post- test frequency and %
12 – 23 (Mild)	0	11 (35.48)
24 – 35 (Moderate)	11 (35.48)	18 (58.06)
36 – 48 (Severe)	20 (64.52)	2 (6.45)
Total	31 (100)	31 (100)

Table 4. Effect of virtual operating room tour on anxiety among patients undergoing major surgeries in experimental group
n 1 + n 2 = 62

Parameters	Pre-test		Post-test		Wilcoxon Z Value	P value
-	Mean	SD	Mean	SD	-	-
Level of anxiety	35.65	4.439	19.65	1.836	4.867	<0.0001

Table 5. Comparison of Pre-test and Post-test Mean Anxiety Scores Among Patients Undergoing Major Surgery in the Control Group
n 1 + n 2 = 62

Parameters	Pre-test		Post-test		Wilcoxon Z Value	P value
-	Mean	SD	Mean	SD	-	-
Level of anxiety	37.10	4.942	26.23	5.264	4.866	<0.0001

Table 6. Comparison of pre and post-test level of anxiety among patients undergoing major surgery in experiment and control group
n 1 + n 2 = 62

Level of anxiety	Experiment (n=31)		Control (n=31)		Wilcoxon Z Value	P value
-	Mean	SD	Mean	SD	-	-
Pre test	35.65	4.439	37.10	4.942	0.85	0.40
Post test	19.65	1.836	26.23	5.264	5.90	<0.0001

Table 7. Association of Preoperative Anxiety with Selected Demographic and Clinical Variables
n 1 + n 2 = 62

Demographic variables	Parameters	Experimental group- Pre-test anxiety score			Control group- Pre-test anxiety score		
-	-	n	Mean	SD	n	Mean	SD
Age	Up to 30	10	34.20	5.308	7	36.86	5.699
	31-50	12	36.42	2.968	10	37.80	3.967
	51 and above	9	36.22	5.118	14	36.71	5.469
	F Value	-	0.78		-	0.14	
	P Value	-	0.47		-	0.87	
Gender	Male	15	32.93	4.788	17	36.82	4.707
	Female	16	38.19	1.940	14	37.43	5.374
	MW test: Z Value	-	3.22		-	0.18	
	P Value	-	0.001		-	0.86	
Educational qualifications	Secondary	5	38.80	2.683	5	36.40	6.504
	Higher secondary	6	34.67	4.131	3	40.33	5.132
	Graduate	20	35.15	4.682	23	36.83	4.648
	F Value	-	1.59		-	0.71	
	P Value	-	0.22		-	0.50	

Occupation	Housewife	9	37.78	1.856	3	37.00	7.810
	Farming	4	37.75	4.272	5	37.40	5.814
	Service	6	32.50	4.324	14	38.43	4.146
	Self- employee	4	37.25	2.062	7	35.00	5.508
	Student	8	33.75	5.922	2	34.50	.707
	F Value	-	2.35		-	0.68	
	P Value	-	0.08		-	0.61	
Family monthly income (Rs.)	Up to 20000	10	37.70	2.983	8	36.13	5.688
	20001-40000	12	34.58	4.999	14	37.14	5.655
	40001 & above	9	34.78	4.658	9	37.89	3.140
	F Value	-	1.66		-	0.26	
	P Value	-	0.21		-	0.78	
Type of anaesthesia	General	17	34.65	4.636	16	37.94	5.434
	Spinal	14	36.86	4.016	15	36.20	4.362
	MW test: Z Value	-	1.44		-	1.09	
	P Value	-	0.15		-	0.28	

Discussion

In the present study, the anxiety score was significantly reduced after intervention in the post-test; the anxiety score was significantly lower in the experiment group than in the control group. Leopold Eberhart et al. (2020) conducted research to identify independent predictors of anxiety dimensions and to quantify the relevance of specific fears particularly associated with anesthesia in patients undergoing elective surgery. Among 3200 patients, the mean total preoperative anxiety was 9.9. High anxiety was reported by 40.5% of subjects. The high variability of importance assigned to all specific fears suggests an individualized approach is advisable when support of anxious patients is intended.⁹

Isabel Tulloch and John S. Rubin (2019) to evaluate the level of anxiety patients experience before elective otorhinolaryngology procedures. The second objective of the study was to assess the subject's views on potential strategies to tackle their anxiety. The study evaluated 53 patients, 29 males and 24 females. The Spielberger State-Trait Anxiety Inventory was used. There was neither a significant increase in patients' anxiety levels preoperatively nor a significant increase in anxiety levels postoperatively when results were stratified according to patient gender and age. 54% of patients felt that their anxiety would have been reduced if they had read a procedural information leaflet, and 22% felt anxiety has been reduced if they had received preoperative behavioral training. 17% of patients want more information from surgical team members. And

12% of patients would have liked less information from the surgical team preoperatively.¹⁰

A systematic review done by Yu, Y., Zhou, et al. (2023) evaluated the effectiveness of a virtual operating room tour in reducing perioperative anxiety in adult patients. Participants had shown a positive response to VORT. A study showed VORT can be considered a convenient way to provide perioperative information to reduce anxiety levels.¹¹

A randomized clinical trial was done by Lina Vogt et al. (2021) on a virtual reality tour to reduce perioperative anxiety in an operating setting before anesthesia. And 76 study result shows that although Virtual Operating Room Tour (VORT) did not affect perioperative anxiety, the tour received good patients rating and was perceived as helpful for surgery preparation. In other terms, the subjective benefit of a Virtual Operating Room Tour (VORT) for patients could not be attributed to anxiety reduction.¹²

A randomized control trial done by Jin-Woo Park et al. (2019) on a virtual reality tour of an operating theater could reduce preoperative anxiety by providing a realistic experience for children in the experimental group. This study was designed to determine whether parental co-experience of a preoperative VR tour through a mirroring display could further also reduce preoperative anxiety. Parents' and children's co-experience of the VR tour through mirroring the display was effective in reducing preoperative anxiety in children as well as in parents.¹³ A systematic review and meta-analysis of randomized controlled trials done by Yen-Ju Chen et al. (2022) on the effect of virtual reality

on preoperative anxiety in children. The study shows that virtual reality significantly reduces preoperative anxiety in children as well as improves compliance with anesthesia.¹⁴

Fatma Celik et al. (2018) conducted a study to evaluate preoperative anxiety and fear of anaesthesia using the Amsterdam Preoperative Anxiety and Information Scale (APAIS). The primary objective was to examine the influence of factors such as age, gender, type of surgery, preoperative surgical briefing, recommended type of anaesthesia, and previous anaesthesia experience on patients' preoperative anxiety. The secondary objective was to identify the underlying causes of anxiety related to anaesthesia. The findings revealed a significant negative correlation between patients' age and their desire for information. Participants with university-level or higher education demonstrated significantly higher scores than those with primary or secondary education. Patients scheduled to receive general anaesthesia reported significantly greater anxiety than those undergoing regional anaesthesia. Additionally, female patients exhibited higher anxiety scores than their male counterparts.¹⁵

Implications of findings in nursing

The nurse administrator, when planning new interventions for pre-operative anxiety, needs to find more than just better or different ways or formats of information transfer to reduce the pre-operative anxiety. They should conduct an in-service education programme for the nurses working in the ward and operation theatre regarding preoperative and postoperative measures to reduce preoperative anxiety and management of patients undergoing major surgeries. Further studies should assess possible correlations of anxiety that include quality of life, depression, patient dissatisfaction with the virtual operating room tour and absence of symptoms. Nurses can also conduct research on the effect of a virtual operating room tour on perioperative anxiety.

Conclusion and recommendations:

The anxiety score was significantly reduced after intervention in the experimental group. In a study it was found that a Virtual Operating Room Tour (VORT) was effective in improving pre-operative anxiety in patients undergoing major surgeries. Further studies involving a larger population are recommended to confirm the findings and strengthen their generalisation. Perceptions are different in different cultures. It can be conducted on the population. Further study is needed to understand the barriers which affect the preoperative anxiety in major surgery patients.

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