Effect of Progressive Muscle Relaxation (PMR) Therapy on Preoperative Anxiety Among Patients Posted for Cataract Surgery for the First Time - A Randomized Control Study.

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Abstract

Background: Preoperative anxiety affects 11-80% of surgical patients. Cataract surgery, despite being routine, often triggers significant anxiety, which may increase perioperative risks. While sedatives are commonly used, their side effects necessitate safer alternatives like Progressive Muscle Relaxation (PMR).

Aim: To evaluate PMR's efficacy in reducing preoperative anxiety in first-time cataract surgery patients.

Materials and Methods: The study was conducted in the Department of Psychiatry and Ophthalmology. Eighty participants aged 18-70 years, scheduled for first-time cataract surgery, were recruited, and divided into case and control groups (40 participants each) by simple random sampling. The case group received a supervised session of Jacobson's Progressive Muscular Relaxation (JPMR) a day before surgery, while the control group received no intervention. Anxiety levels were assessed using the Hamilton Anxiety Rating Scale (HAM-A) and the Amsterdam Preoperative Anxiety and Information Scale (APAIS) before and after the intervention. Statistical analysis was performed using SPSS software.

Results: Participants in the case group who underwent JPMR showed a significant reduction in HAM-A scores (mean difference: 1.35, $p < 0.001$) and APAIS scores (mean difference: 2.69, $p < 0.01$). In contrast, the control group exhibited a mild increase in HAM-A scores (mean difference: -0.15, $p = 0.205$) and a slight decrease in APAIS scores (mean difference: 0.8, $p < 0.025$).

Conclusion: Progressive Muscle Relaxation (PMR) therapy is an effective non-pharmacological intervention for reducing preoperative anxiety in patients undergoing first-time cataract surgery.

Key words: Preoperative anxiety Cataract surgery Progressive Muscle Relaxation

Introduction

Anxiety is defined as an unpleasant emotional state characterized by fear, tension, and nervousness[1]. During the preoperative period, surgical candidates often experience situations that trigger psychological anxiety, leading to stress both during and after surgery. This anxiety, arising from the disease itself, hospitalization, and the anticipation of surgery, is referred to as preoperative anxiety[2].

The prevalence of preoperative anxiety varies widely, ranging from 40 to 60% in young children to 11-80% in adults. In one study, 23.99% of patients were found to experience severe preoperative anxiety[3]. Cataract, the opacification of the eye lens, is one of the leading causes of vision loss worldwide[4]. Cataract surgery is the most performed eye operation globally and remains the only effective treatment option, offering excellent visual outcomes[4,5].

Advancements in anaesthesia and surgical techniques have enabled most cataract extraction procedures to be performed under topical anaesthesia. This has significantly reduced operating time and minimized side effects associated with local or general anaesthesia[6]. However, patients still experience considerable anxiety, along with some level of pain and discomfort during the procedure[2]. Preoperative

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anxiety can have both psychological and physiological adverse effects on patients, regardless of age. It can interfere with the surgical process and potentially put patients at risk during surgery[2]. Studies have shown that patients with lower stress levels experience fewer complications before and after surgery[7].

Given the adverse effects of preoperative anxiety, effective treatment is essential. Currently, two main types of interventions are recognized: pharmacological and non-Pharmacological.

Pharmacological interventions typically involve the use of sedatives and anti-anxiety drugs, such as midazolam, diazepam, ketamine, and fentanyl[8]. However, these medications can have side effects, including breathing difficulties, drowsiness, interference with anaesthetic agents, and prolonged recovery times. As a result, non-pharmacological interventions are increasingly being preferred. In fact, 46.3% of anaesthesiologists report favouring non-pharmacological methods over pharmacological ones for managing preoperative anxiety in both paediatric and adult patients[9]. non-pharmacological methods, such as relaxation techniques, are considered therapeutic exercises that can alleviate tension and anxiety, benefiting both the mind and body[10] These techniques have been shown to reduce cortisol levels, thereby decreasing both somatic and subjective experiences of stress[11] thereby influencing the outcome. Progressive Muscle Relaxation (PMR) is one such technique, which involves systematically tensing and relaxing muscle groups throughout the body, with an emphasis on the relaxation phase[10]. In our clinical setting, the conventional approach involves obtaining informed consent and prescribing a short-acting benzodiazepine to reduce preoperative anxiety. Against this backdrop, the aim of this study was to evaluate the effectiveness of a non-pharmacological method-Progressive Muscle Relaxation (PMR) therapy in reducing preoperative anxiety among patients scheduled for first-time cataract surgery.

Materials and Methods

The study was conducted in the Department of Psychiatry and Ophthalmology, S. Nijalingappa Medical College, and Hospital, Bagalkot

Sample size estimation was done using open epi software version 2.3.1.

Sample size was calculated using the formula, $n= 2(Z\alpha+ Z_{1-\beta})^2 \sigma^2 / d^2$.

The estimated sample size was 20 in each group, increased to 40 in each group for better outcome.

Inclusion Criteria

Patients attending the Department of Ophthalmology, aged between 18-70 years. Posted for cataract surgery for the first time. Willing to participate in the study and able to provide written consent.

Exclusion Criteria

Patients below the age of 18 years and those who do not consent. Patients with pre-existing diagnosed psychiatric illness.

In total, 80 cases were recruited and divided into case and control groups, by simple random sampling consisting of 40 participants in each group. A semi structured socio-demographic profile was collected for all participants.

Intervention

For the case group, after the morning assessment, a brief introduction to Jacobson's Progressive Muscular Relaxation (JPMR) was provided. During the training session, participants received detailed explanations about the JPMR technique, its effects on anxiety reduction, and its step-by-step implementation. They were instructed to sit in a comfortable position in a quiet environment, focus on each muscle group, and alternately tense and relax specific muscles in a sequential manner from the feet upward to the face while maintaining slow, deep breathing. The procedure was demonstrated by the investigator, who had undergone prior training in JPMR and was responsible for carrying out the intervention. Participants were encouraged to practice the technique under supervision, and the instructions were repeated multiple times to ensure understanding and reinforce proper technique. The investigator also addressed individual questions and provided clarifications as needed. In the evening, a supervised JPMR session lasting approximately 20 minutes was conducted by the same trained investigator. Immediately afterward, HAM-A and APAIS were re-administered to assess post-intervention anxiety levels.

The control group did not receive any psychological or relaxation intervention. However, they underwent the same assessment schedule as the case group, with HAM-A and APAIS administered in the morning and evening on the day prior to surgery. In the absence of the JPMR intervention, control participants received routine preoperative care, including standard medical evaluation, counselling by the surgical team, and information regarding the surgical procedure, as per institutional protocols. This no-intervention control design was considered ethically appropriate, as all participants continued to receive standard preoperative care without withholding any established or recommended treatments.

Assessment Tools

Hamilton Anxiety Rating Scale (HAM-A):

A widely used clinical tool designed to quantify the severity of anxiety symptoms. It consists of 14 items, each assessing a different aspect of anxiety total score of 0-56, where <17 indicates mild severity, 18-24 mild to moderate severity and 25-30 moderate to severe [11].

Amsterdam Preoperative Anxiety and Information Scale (APAIS):

A simple and reliable 6-item questionnaire to assess preoperative anxiety. It measures anxiety and the need for information with good reliability and validity [12].

Statistical Analysis

The difference in anxiety levels following pre- and post-administration of JPMR was analysed in comparison with the control group. Data obtained was tabulated in the Excel sheet and analyzed. Quantitative data was expressed as mean ± standard deviation and nonparametric data was expressed as median and min-max values. Percentages were used for representing qualitative data. Chi-square test for proportions in qualitative data. Student's unpaired t-test for Quantitative data. P< 0.05 was considered statistically significant.

Results

Table 1: Demographic details of cases and controls

PARTICULARS	CASES	CONTROLS
Mean age (years)	62.6	61.9
Male n (%)	20 (50%)	20(50%)
Female n (%)	20 (50%)	20 (50%)
Mean years of education	4.7	3.2
Medical Co morbidities n (%)	12 (30%)	10 (25%)
History of previous surgery n (%)	11 (27.5%)	12 (30 %)

Table 1 shows the sociodemographic profile of the participants. There were equal numbers of males and females in each group. The mean age among the cases was 62.6, and in the control group, it was 61.9, which were both matching. Medical co morbidities were common with both groups showing 12 in cases and 10 in controls. 11 patients among cases and 12 among controls gave a history of previous surgery.

Table 2: Comparison of HAM-A Scores Between Cases and Control Groups

HAM-A	CASES		CONTROLS	
	Mean	SD	Mean	SD
1st Assessment	17.75	3.72	14.65	1.29
2nd Assessment	16.40	4.24	14.80	1.14
Mean difference	1.35		-0.15	
t value	7.94		1.29	
p-value	<0.001		0.205	

Table 2 Shows the case group showed significant reduction in HAM-A scores post-intervention while the control group had a slight, non-significant increase.

Table 2 shows HAM-A Scores of Participants. It shows participants (cases) who underwent JPMR intervention showed a reduction in HAM-A scores (mean difference: 1.35), which was statistically significant ($p < 0.001$). In the control group, without JPMR intervention, there was a mild increase in HAM-A scores (mean difference: -0.15), which was not significant ($p = 0.205$).

Table 3: Comparison of APAIS Scores Between Cases and Control Groups

APIAS	CASES		CONTROLS	
	Mean	SD	Mean	SD
1st Assessment	14.35	1.96	16.30	3.25
2nd Assessment	10.30	1.87	15.50	3.11
Mean difference	2.69		0.8	
t value	9.527		2.34	
p-value	<0.001		0.025	

Table 3 Shows the case group demonstrated a significant reduction in APAIS scores post-intervention, while the control group showed a smaller non- significant decrease.

In Table 3 it shows APAIS Scores. There was a significant ($p < 0.01$) decrease in APAIS scores in the case group participants who underwent JPMR (mean difference: 2.69). In the control group, there was a mild decrease in APAIS scores (mean difference: 0.8), which was significant ($p < 0.025$).

Discussion

The baseline sociodemographic and clinical characteristics of participants in this randomized controlled trial are presented in Table 1. This table shows that the mean age was comparable between the two groups (Cases: 62.6, Controls: 61.9), and gender distribution was equal (40 per group). Years of education were slightly higher in the case group (4.7 vs. 3.2), which could have influenced anxiety perception and responsiveness to interventions like

PMR. Studies have shown that demographics such as age and education level may influence preoperative anxiety. For instance, Nigussie et al[13] found that lower education levels were associated with higher anxiety, suggesting that the case group's slightly higher education might have aided in understanding and engaging with PMR more effectively. The history of previous surgery and comorbidities were nearly balanced between groups, minimizing confounding influences. This similarity strengthens the internal validity of the intervention effect on anxiety outcomes.

TABLE 2 shows that the HAM-A scores decreased significantly in the intervention group (Cases: from 17.75 to 16.40, $p < 0.001$), while the control group showed a non-significant increase (14.65 to 14.80, $p = 0.205$). This demonstrates a clinically meaningful reduction in general anxiety levels due to PMR. This aligns with previous findings of Hasanpour-Dehkordi et al[14]. who demonstrated a significant reduction in HAM-A scores in surgical patients who practiced PMR. Moreover, Shear et al[11]. confirmed that HAM-A is a reliable measure for such clinical trials, supporting the validity of our measurement approach. Our study further adds value by showing this effect specifically in cataract surgery patients, a population often underrepresented in anxiety intervention studies.

TABLE 3 shows APAIS scores dropped significantly in the case group (from 14.35 to 10.30, $p < 0.001$), while the control group showed a small but significant decrease (16.30 to 15.50, $p = 0.025$). This suggests that PMR is more effective than standard care in reducing preoperative anxiety specifically related to surgery and anaesthesia.

Barabady et al.[15] showed similar findings, reporting that relaxation techniques reduced APAIS and even intraoperative anesthetic needs.

Our results also mirror those of Wang et al.[16], who reviewed non-pharmacologic interventions and concluded that relaxation techniques were among the most effective for managing preoperative anxiety.

The magnitude of anxiety reduction in our study, measured by APAIS, demonstrates that PMR can be effectively implemented even in low-resource, high-volume ophthalmic surgical canters. However, several limitations must be acknowledged. First, the single-centre design limits the generalizability of findings to other hospital settings and patient populations. Second, the influence of participants' education level and health literacy was not controlled, which may have affected their ability to understand and effectively engage with the JPMR technique. Third, the study did not employ blinding, which could have introduced observer or participant bias in the post-intervention assessments. Fourth , mean Anxiety scores on HAM-A in controls is less than cases this highlights the two groups differ at baseline. Finally, the short-term follow-up period restricted the ability to assess the durability of the observed anxiety reduction over time.

Given these limitations, future research should aim to address them in a more robust design. Multi-centre randomized controlled trials involving a more diverse population would enhance the external validity of findings. Comparative studies evaluating JPMR against other evidence-based anxiety-reducing interventions, such as guided imagery or mindfulness-based techniques, would help determine its relative efficacy. Additionally, longitudinal studies are needed to examine the long-term impact of JPMR on anxiety, recovery, and postoperative outcomes. Finally, research assessing the cost-effectiveness and feasibility of implementing JPMR in routine clinical practice could support broader adoption if proven beneficial.

Conclusion

PMR is a non-invasive, simple, and easy-to-teach technique that can be practiced in various settings. It is cost-effective and has been shown to significantly reduce anxiety and stress. Our study further supports these findings, demonstrating that PMR administration effectively reduces Preoperative anxiety, with results consistent with previous research.

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