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Physiological Basis of Deep Breathing Exercises in Chronic Pain Management

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ABSTRACT

Deep breathing exercises are increasingly recognized as effective non-pharmacological interventions for managing chronic pain. This study aimed to evaluate the benefits of deep breathing exercises in patients with chronic pain who did not respond to conventional analgesics. A total of 100 patients were randomly selected from various outpatient departments at Government Medical College and ESI Hospital, Coimbatore. These patients were divided into two groups: one receiving standard analgesic treatment and counseling, and the other receiving additional instruction in deep breathing exercises. Over a period of three months, the effectiveness of these exercises was assessed. Results indicated that approximately 70% of patients practicing deep breathing reported significant pain relief, with notable improvements in symptoms such as headaches, muscle pain, and joint pain. The findings suggest that deep breathing exercises may enhance the overall management of chronic pain by promoting relaxation, reducing stress, and improving oxygenation. This study highlights the potential of integrating deep breathing exercises into pain management protocols, offering a simple and effective strategy to improve patient outcomes.

Keywords: Chronic Pain, Deep Breathing Exercises, Pain Management

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INTRODUCTION

Deep breathing exercises are recognized as effective tools for managing both acute and chronic pain. These exercises induce relaxation and alleviate stress by activating the body's relaxation response. While definitive clinical evidence is still emerging, some studies suggest a positive link between deep breathing and pain relief. The physiological mechanism involves increased oxygen intake and stimulation of the parasympathetic nervous system, promoting relaxation and reducing pain perception. This leads to lowered heart rate, decreased blood pressure, and the release of endorphins, the body's natural pain relievers. Additionally, deep breathing aids in improved oxygenation and muscle tension reduction, further enhancing pain relief.

Aim of the Study

To study the benefit of deep breathing exercises in patients with chronic pain of various causes.

MATERIAL AND METHODS

A total of 100 patients with chronic pain, who did not respond to conventional analgesics, were randomly selected for the study from various outpatient departments of Government Medical College and ESI Hospital, Coimbatore, between January 2024 and March 2024. After obtaining written consent, these patients were taught deep breathing exercises (abdominal breathing), and the results were consolidated after three months.

Deep Breathing: Definition and Mechanics

Deep breathing, also known as diaphragmatic or abdominal breathing, involves taking slow, steady deep breaths using the diaphragm, a muscle below the lungs. Unlike shallow breathing, which primarily uses chest muscles and does not bring in as much oxygen, deep breathing utilizes the diaphragm to allow the lungs to fill with more air.

During inhalation in diaphragmatic breathing, the diaphragm contracts and descends, expanding the chest cavity and facilitating increased air intake into the lungs. Conversely, during exhalation, the diaphragm relaxes and returns to its dome-shaped position, aiding in the expulsion of air from the lungs.

Chronic Pain: Definition and Epidemiology

According to the International Association for the Study of Pain (IASP), chronic pain refers to persistent or recurring pain lasting beyond a three-month period, often becoming the primary health concern for some individuals. This type of pain may require specific diagnosis, treatment, and rehabilitation. It is a common condition, impacting approximately 20% of the global population.

Chronic pain is different from typical pain, where the body continues to send pain signals to the brain even after an injury heals. This can last for several weeks to years and can limit mobility, flexibility, strength, and endurance, making daily tasks and activities challenging.

Physiological Mechanisms of Pain Alleviation through Deep Breathing Exercises

Parasympathetic Activation: Deep breathing triggers the vagus nerve, boosting parasympathetic activity, which relaxes the body by slowing the heart rate, lowering blood pressure, and easing muscle tension, potentially reducing pain.

Stress Reduction: Deep breathing techniques may lower cortisol levels, a stress hormone linked to heightened pain sensitivity, thereby helping to manage pain.

Oxygenation and Cleansing: Deep breathing enhances oxygen intake and carbon dioxide removal, improving tissue oxygen levels and blood flow, which can alleviate pain.

Distraction: Focusing on deep breathing serves as a mental distraction, diverting attention away from pain signals and reducing the perception of pain intensity.

Endorphin Release: Deep breathing rhythms may prompt the release of endorphins, the body's natural painkillers, which can help relieve pain.

Gate Control Theory: Deep breathing engages non-painful sensory input, closing the "gates" that allow pain signals to reach the brain, thereby reducing the sensation of pain.

Muscle Relaxation: Deep breathing induces muscle relaxation, easing tension that contributes to pain, particularly in conditions like back pain or headaches.

Review of Literature

Impact of Deep Breathing on Pain

Jafari et al. (2020): In an experiment with 48 healthy volunteers, different breathing methods were tested for pain reduction. Slow deep breathing with more exhales than inhaled was found to reduce pain more than other methods.

Wang et al. (2022): This systematic review assessed the efficacy of breathing exercises for pain management in cancer survivors. Some breathing techniques were effective in reducing post-surgery and pediatric cancer pain.

Joseph et al. (2022): This meta-analysis explored the effects of Slow Deep Breathing (SDB) on acute pain. SDB was associated with significantly reduced pain scores post-intervention.

RESULTS

The study included 100 participants (50 males and 50 females). 50% of them were given only analgesics and counseling, while the other 50% received deep breathing exercises along with these treatments. The results showed that about 70% of the study group responded well to the treatment with deep breathing exercises, and the P value was significant in all chronic pains except abdominal discomfort.

Table 1: Symptoms and Improvement with Deep Breathing Exercise

Symptoms	No. of Patients	Improved with Deep Breathing Exercise	Percentage	P value
Headache	16	12	75%	0.006
Muscle pain	11	9	81%	0.001
Non-specific pains	9	6	66%	0.04
Abdominal iscomfort	16	8	50%	0.98
Joint pain	29	22	75%	0.006
Low back pain	19	14	73%	0.009

Table 2: Age and gender wise distribution

S.No	Age	Male	Female	Total
1	20-30	06	11	17
2	31-40	08	10	18
3	41-50	09	11	20
4	51-60	06	05	11
5	61 & above	17	17	34
Total				100

Deep breathing exercises show promise for helping with pain relief by activating relaxation responses in the body, reducing stress, improving oxygen flow, and releasing natural painkillers. Historical practices from different cultures also support the idea that deep breathing can be beneficial. While research suggests that deep breathing can indeed help reduce pain, more studies are needed to confirm its effectiveness and find the best ways to use it. Overall, deep breathing offers a drug-free option for managing pain with few side effects and potential improvements in quality of life, making it worth exploring further in medical treatments.

DISCUSSION

The findings of this study underscore the significant potential of deep breathing exercises as a complementary approach in the management of chronic pain. The observed 70% improvement in pain symptoms among patients who practiced deep breathing exercises, as compared to those who only received analgesics and counseling, suggests a robust efficacy of this intervention.

Deep breathing exercises appear to alleviate pain through several physiological mechanisms. The activation of the parasympathetic nervous system, triggered by deep diaphragmatic breathing, plays a crucial role in promoting relaxation and reducing the perception of pain. This process is complemented by the reduction in stress hormones, such as cortisol, which are known to exacerbate pain sensitivity. The increased oxygenation of tissues and improved blood flow resulting from deep breathing further contribute to pain relief by enhancing tissue repair and reducing muscle tension.

The comparative effectiveness of deep breathing exercises across different types of chronic pain conditions was particularly noteworthy. The significant pain relief observed in conditions such as headaches, muscle pain, and joint pain, with p-values indicating strong statistical significance, highlights the versatility of this intervention. However, the lesser effectiveness in managing abdominal discomfort, as reflected by a non-significant p-value, suggests that the benefits of deep breathing may vary depending on the type and location of pain.

These findings have important implications for clinical practice. Incorporating deep breathing exercises into standard pain management protocols could provide a non-invasive, low-cost, and side-effect-free alternative to traditional pain medications. This is especially pertinent given the growing concerns over the long-term use of analgesics and the potential for dependency and adverse effects. By reducing reliance on medications, patients can also avoid the complications associated with chronic use, such as gastrointestinal issues and opioid dependence.

The historical and cultural roots of deep breathing practices in traditions such as Pranayama, Qigong, and Zen Buddhism lend further credibility to its effectiveness. These practices have long been associated with enhanced mental and physical well-being, and their integration into modern pain management strategies offers a holistic approach to patient care.

While the results are promising, this study has several limitations that need to be addressed in future research. The sample size was relatively small, and the study was conducted over a short period. Larger-scale studies with longer follow-up periods are needed to validate these findings and to determine the long-term benefits of deep breathing exercises. Additionally, exploring the specific mechanisms through which different types of deep breathing exercises affect various pain conditions could provide more targeted therapeutic strategies [1-9].

CONCLUSION

In conclusion, deep breathing exercises show considerable promise in managing chronic pain, offering a complementary approach that can enhance patient outcomes and reduce the need for conventional analgesics. Further research is warranted to fully understand the potential of this intervention and to integrate it more effectively into clinical practice. By embracing such holistic methods, healthcare providers can offer more comprehensive and patient-centered care, improving the quality of life for those suffering from chronic pain.

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