Impact of Slow Deep Breathing on Pain in Head Injury Patients: A Systematics Review

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Abstract

Introduction: Head injury is a global health problem that often resulted from traffic accidents, and has a serious impact on brain and nervous system function. One of the main symptoms of head injury is intense pain, which often affects patients' quality of life. Although pain medications are widely used, non-pharmacological interventions such as the Slow Deep Breathing (SDB) technique have been proposed as an effective alternative to reduce pain in head injury patients. This study was aimed to evaluate the impact of SDB on pain reduction in patients with head injury.

Subject and Methods: This systematic review was conducted using the PRISMA method with journal searches in several databases such as Google Scholar and PubMed. The search focused on studies published between 2020 to 2024. Screened articles had to meet the inclusion criteria involving observational studies on SDB in head injury pain. In this systematic review, information was collected by highlighting key elements, including the population group, type of intervention measures, outcomes observed, and methodological approach chosen.

Result: of the 425 journals identified, 95 articles were screened, and 4 journals met the criteria for further discussion. The results of the four studies showed that the SDB technique significantly reduced pain intensity in head injury patients. SDB helped lower heart rate, blood pressure, and improve blood oxygenation, all of which contributed to pain reduction.

Conclusion: Slow Deep Breathing technique was shown to be effective as a non-pharmacological treatment for managing pain in head injury patients. Despite some limitations in sample size and study design, consistent results support the use of SDB as a complementary therapy in pain management. Future research is needed to inform the maximum therapeutic activity of SDB and explore the potential for combination with other therapies.

Key words: Slow deep breathing, pain, head injury

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Introduction

Head injury is one of the major health problems faced worldwide, including in Indonesia. According to a study reported by Riskesda in 2013, approximately 40.6% of head injury cases in Indonesia were caused by traffic accidents.[1] Head injuries can have a serious impact on brain and nervous system function, resulting in morbidity, physical disability and death.[2,3] Head injuries are classified by severity, with mild, moderate and severe head injuries.[3] Many patients with head injuries report severe pain as one of the main symptoms. This pain often interferes with the

patient's quality of life and can affect the recovery process.[4,5] In its management, pharmacological approaches such as the administration of pain medications are often used.[5] However, the use of these medications is not always effective and may cause adverse side effects, especially if used over a long period of time.[6,7] As an alternative to pharmacological approaches, various non-pharmacological interventions have been proposed to help reduce pain in head injury patients.[8,9] One of the most promising methods is slow deep breathing (SDB) relaxation. SDB is a breathing technique that involves a slow and controlled inhalation of a deep breath, followed by a slow exhalation.[8] The main purpose of this technique

is to create a deep state of relaxation in the body, can control the nervous system, and reduce the body's response to pain.[10] The SDB technique has several advantages over pharmacological approaches. First, this technique does not require special equipment, so it can be applied in health services and at home. Second, patients can do it according to their condition or pain, which means that this technique can be applied without the need for assistance from medical personnel. Third, this therapy does not cause side effects, so it is safe to be used for a long period of time.[11]

Several previous studies have shown that the SDB technique is effective in reducing pain intensity in various medical conditions, including patients with head injuries.[11] For example, a study conducted in 2020 reported that patients who applied the SDB technique during head injury treatment experienced a significant reduction in pain scale compared to those who did not use this technique.[12] Other studies have also shown that SDB can help reduce anxiety and stress, which are often related to pain intensity.[14] The mechanism of action of SDB is related to the activity of the parasympathetic nervous system, which is responsible for reducing the body's stress response, when a person takes a deep and slow breath, the heart rate slows down and blood pressure decreases, which creates a calming effect on the body, in addition, deep breathing also helps increase oxygenation of the brain and other body tissues, which can speed up the recovery process and reduce pain.[15] Through literature review and research findings, it is important to further understand how the SDB Technique can benefit patients with head injuries. This study was aimed to evaluate the impact of slow deep breathing on pain reduction in head-injured patients, as well as to understand the mechanisms underlying the effectiveness of this technique in reducing pain. With the existence of non-pharmacological interventions such as this, it is hoped that it can provide a safer, effective and affordable alternative in the management of pain in head injury patients.[16] Thus, the results of this study are expected to not only contribute to the management of pain in head injury, but also provide new insights into how non-

pharmacological interventions can be applied more broadly in different medical contexts. Overall, the SDB technique has great potential to be an integral part of a holistic approach to pain management in head injury patients. with the hope that comprehensive and continuous research on SDB techniques can become one of the leading nonpharmacological techniques in overcoming pain problems.

Methods

Research Design
This systematic review was conducted using the PRISMA methodology, which is a complex systematic approach in determining search strategies, searching for information sources, determining criteria and quality assessments and then inclusion of journals that are suitable according to the inclusion criteria and then discussed in the study.

Search Strategic
This type of research is a review (Systematic Literature Review) the stages and strategies carried out by researchers are to search for information and study documents from several databases using Boolean Operators to limit or expand the search by entering keywords for research titles and independent variables, namely, Slow Deep Breathing OR and head injury pain, journals or scientific articles taken in the last 4 years, namely 2020 to 2024. Some of the databases used in this research to search for journals in Indonesian and English, Googlescholar, Pubmed, after entering the keywords, each journal and article can be copied into the Mendeley application, then filtered based on inclusion and exclusion criteria that are suitable as sources in this study.

PICO approach
The literature data search strategy is continued by composing questions with the PICO pattern (Population, Intervention, Comparison and Outcomes). Researchers compiled questions in this study to narrow down the problems to be discussed in the study and with all questions answering the research objectives systematically.

Table 1. PICO Method

Component	Description
Population/ Problem	Patients with Moderate, Mild to Severe Head Injuries
Intervention	Use of Slow Deep Breathing technique to reduce pain
Comparison	No comparison factor
Outcomes	Pain reduction in patients who apply SDB

Eligibility Criteria
The criteria in this study are inclusion and exclusion criteria, as follows table 2.

Quality Assessment
The quality assessment of the literature in this study researchers used the PRISMA (Preferret Reporting Item for Systematic Reviews) method for selecting scientific journals according to the criteria on the dependent variable and the

Tabel 2 Description of Inclusion Criteria and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Scientific journal focusing on observational studies related to SDB and pain in head injury patients	Literature reviews, meta-analyses, or editorial articles that do not involve primary observational data
Patients with mild to severe diagnoses, both male and female	Studies that do not specifically focus on the use of Slow Deep Breathing for Head pain
Studies evaluating the use of SDB Technique as a primary or adjunctive intervention to reduce pain	Studies that evaluate intervention methods other than SDB as a key component for pain management
Journals compiled in English and Indonesian	Articles written in other than English and Indonesian
Journal published Post 2020	Articles published Pre 2020
Journals with full-text access to abstracts and keywords available	Articles that do not have full text to evaluate
Studies reporting the results of pain intensity reduction in head injury patients after SDB techniques were performed	

The following is a strategy for finding data based on the PRISMA Protocol using the PICO method, as follows table 1.

Based on the above components, the researcher includes the following research questions:
• Is the SDB technique effective in reducing pain in head injury patients?
• How do the results of various studies assessing the effect of SDB on pain patients with head injuries compare?

Source Information
Sources of information in this study researchers conducted case studies and document studies and sought information from several databases, namely, Googlescholar, Pubmed. After finding cases and health problems, researchers determine the title according to the case obtained.

independent variable, by means of journals based on exclusion was excluded or were not discussed while journals that entered the inclusion criteria were discussed.

Data Synthesis
The data synthesis process in this study was carried out based on the title and objectives of the study and compared scientific journals that met the quality assessment. The variables and research objectives themselves refer to the impact of SDB and pain in head injuries.

Data Extraction
In this data extraction or output, researchers display scientific journals that have been filtered using the PRISMA method, processed in tabular form based on research variables then enter the researcher's name, year of research, journal title, journal name, research design, sample and results.

III. Results
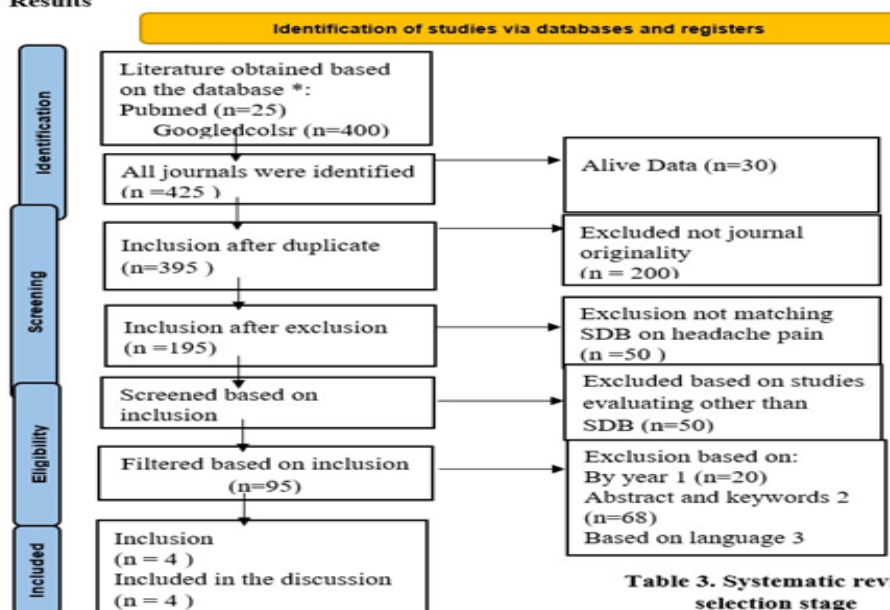
Identification of studies via databases and registers

Table 3. Systematic review selection stage

Referring to the PRISMA 2020 method, the literature selection process was carried out through two databases, namely PubMed with 25 articles and Google Scholar with 400 articles, so that a total of 425 articles were identified. Of these, 30 articles were deleted because they were duplicates, while 200 articles were excluded because they did not meet the originality criteria. Furthermore, 50 articles were excluded because they were not relevant to the Slow Deep Breathing technique, while another 50 articles were excluded because they did not review the evaluation of the technique. An additional 68 articles were eliminated after further review through abstracts and keywords. In addition, 20 articles were excluded due to inappropriate year of publication, and another 2 articles were excluded due to language not meeting the

Table 3. Journal review results based on Slow Deep Breathing on Pain in Head Injury

Autho	Title	Journal	Design	Sample	Results
Dadi Hamdani,et.al, 2023	Slow Deep Breathing Intervention to Reduce Paint Intensity in Mild Head Injury Patients	Jurkes – Vol. 10, No. 02 (October 2023) ISSN:2089-3906 EISSN: 2656-5838	RCT	CKR Patients	Significant pain reduction on postoperative days 1 to 3
Zainar Kasim,et. al,2021	Effect of Slow Deep Breathing Therapy on Head Pain Intensity in Mild Head Injury Patients at the Emergency Room of Bhayangkara Hospital Manado	Journal of Information, Science and Technology, P-ISSN: 2621-0940, E-ISSN: 2829-2758, Page 119-127	Experiment	CKR patients in emergency room	Pain decreased from scale 7 to scale 3 within 20 minutes after therapy
Dwi Cahyo Pribadi Putro, et.al,2023	Application of Slow Deep Breathing to Lower the Pain Scale in Patients with Mild Head Injury (CKR) at Dr. Moewardi Surakarta Hospital	Journal of Health and Nutrition Sciences (JIG) Vol.1, No.4 October 2023 e-ISSN: :2964-7819; p-ISSN: :7962-0325, Page 73-83	Quasi-Experiment	CKR Patients	Pain scale decreased significantly (p<0.05) after intervention
Zuhtriana,et. al,2024	Providing Slow Deep Breathing Therapy to Reduce Pain Intensity in Post Craniotomy Patients with Head Injuries at Vita Insani Hospital Pematang Siantar	Indonesian Journal of Science E-ISSN 3062-8784	Experiment	post craniotomy patients	Significant pain reduction on postoperative days 1 to 3

Results

Referring to the PRISMA 2020 method, the literature selection process was carried out through two databases, namely PubMed with 25 articles and Google Scholar with 400 articles, so that a total of 425 articles were identified. Of these, 30 articles were deleted because they were duplicates, while 200 articles were excluded because they did not meet the originality criteria. Furthermore, 50 articles were excluded because they were not relevant to the SDB technique, while another 50 articles were excluded because they did not review the evaluation of the technique. An additional 68 articles were eliminated after further review through abstracts and keywords. In addition, 20 articles were excluded due to inappropriate year of publication, and another 2 articles were excluded due to language not meeting the criteria (only English and Indonesian were selected). Thus, 4 articles met the final requirements to be analyzed in this systematic review.

Discussion

Consistent Research Results
The results of the four studies analyzed in this review showed consistency in reducing the level of discomfort in patients with head trauma who were given SDB technique. Each study reported a significant reduction in pain scale after SDB intervention, indicating that this technique is effective as a non-pharmacological method in managing pain in head injury patients.[10]

The study conducted by Vita Insani Hospital Pematangsiantar showed a significant reduction in post-craniotomy patients, where SDB provided benefits not only to reduce subjective pain but also to reduce the need for pharmacological analgesics.[2] Similar results were also found at Dr. Moewardi Hospital, where SDB successfully reduced the pain scale in mild head injury patients. Research at RS Bhayangkara Manado also supported these findings by noting a rapid reduction in pain for head injury patients in the emergency department.[10] These similar results suggest that SDB could be a feasible intervention to implement in various healthcare facilities, whether in the emergency room, inpatient setting, or in the context of post-operative care.[11,12]

Mechanisms of Pain Reduction
Physiologically, the SDB technique works through a mechanism that involves regulation of the autonomic nervous system.[1] The technique affects the parasympathetic nervous system, which works to calm the body and lower the stress response through the reduction of sympathetic nervous system activity.[4] In this regard, SDB helps to lower heart rate, blood pressure and improve blood oxygenation.[6] All these factors contribute to a decrease in pain perception as the body is in a deeper state of relaxation.[3] Past research has also shown that deep breathing techniques can affect pain receptors and neurotransmitters involved in pain processing, such as endorphins and serotonin. By performing SDB, patients can achieve a state of muscular relaxation and mental calmness, which accelerates the release of these hormones, reducing tension and stress that often worsen pain.[4]

Research Limitations
Although the results from the four journals showed significant effectiveness, there are some limitations that need to be considered:
Sample Size: Some studies had small sample sizes, which could affect the generalizability of the results. Studies with larger sample sizes and more diverse populations would be more convincing to support the wider effectiveness of SDB.[3]
Research Design: Two out of four studies used a quasi-experimental design, which while providing important data, is more prone to bias compared to a Randomized Controlled Trial (RCT) design. The lack of control groups in some studies could also affect the validity of the results.[12]
Uncontrolled Variables: Some studies may not comprehensively control for other variables that could affect the results, such as the use of additional analgesic medications, patient anxiety levels, or other factors related to demographic background (age, gender, medical history).[7]
Duration of Intervention: In some studies, the duration of the SDB intervention was relatively

short (e.g. only once or for a few days).[8] There is a need for more large-scale scientific development to assess the sustained benefits of SDB techniques in managing chronic pain in head injury patients. Pain Measurement Tools: Studies used various pain measurement tools such as the Numeric Rating Scale (NRS) and Visual Analog Scale (VAS). While both tools are valid and reliable, differences in the use of measurement tools may affect the consistency of results between studies.[14]

Clinical Implications

This discovery has several important clinical implications:
Wide Application in Various Healthcare Facilities: The SDB technique can be applied in various clinical settings, both in the management of acute pain in the emergency room and in post-operative pain management. This gives room for healthcare professionals to use this technique as an easy-to-perform, safe and effective adjunctive intervention without significant side effects.[10]

Reduced Dependence on Analgesics: With a proven significant reduction in pain intensity, SDB can be used as a way to reduce the use of analgesic medications, which often have side effects and risk of dependence. In the context of head injury treatment, especially in patients who may already be receiving various other medications, this is a significant advantage.[11]

Flexibility and Cost Effective: SDB is a simple technique, can be learned by patients quickly, and does not require expensive medical equipment. This makes it a cost-effective solution, especially in areas with limited healthcare resources.[12]

Recommendations for Future Research

Based on the results and limitations found in this study, there are several recommendations for future research:
Studies with RCT Design: Further research with a Randomized Controlled Trials (RCT) design involving control and experimental groups may provide stronger and more reliable results.[1]
Larger Sample Size: Future studies should use larger sample sizes to increase statistical power and ensure that the study results can be

generalized to a wider population.[3]
Long-term Studies: Studies that look at the broader effects of SDB use are needed. in patients with chronic pain from head injuries. This is to evaluate whether the reported positive effects can be sustained over a longer period of time.[3]
Combination with other therapies: Given that SDB is a non-invasive and easy-to-implement technique, further research could also explore its effectiveness when combined with other non-pharmacological pain therapies, such as progressive muscle relaxation or music therapy.[6]

Conclusion

The results of the four studies in this review support the hypothesis that SDB is a useful intervention of managing pain in head injury patients. Although there are some limitations in design and sample size, these results still provide strong support that SDB can be used as a complementary non-pharmacological therapy in pain management.

Practitioner Recommendations
1. SDB can be implemented in various clinical settings, especially in the context of mild to moderate head injuries.
2. Nurses and other healthcare personnel need to be trained to effectively apply this technique in patients who require non-pharmacological pain management.

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