Effect of Non-Pharmacological Pain Management Program on Nurses Performance and Patient Clinical Outcomes Undergoing Cardiothoracic Surgery

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Abstract

Background: Non-pharmacological measures are an important part of pain management that is used by critical care nurses to increase the tolerance of experienced pain, decrease physical stress**.** ***The study aimed to*** evaluate the effect of non-pharmacological pain management program on nurses' performance and patient clinical outcomes undergoing cardiothoracic surgery ***Research design:*** A quasi experimental research design was conducted**.** ***Tools of data collection:*** An interview questionnaire and observational checklist for nurses were used to collect data, also patient assessment questionnaire (patient characteristic and postoperative patient's clinical outcome)**.** ***Study subjects***: convenient sample of available nurses (35) working in cardiothoracic surgery wards and open heart ICU at Zagazig University Hospitals, also purposive sample of 35 patients undergoing cardiothoracic surgery. ***Results:*** The current study showed that there were a significant direct association between nurses' knowledge pre/post with nurses' practice pre/post and patient' outcomes pre/post. Whereas there was a significant inverse association between nurses' knowledge pre/post, post nurses' practice among studied nurses and patients outcome. Meaning increase both nurses knowledge score, post nurses' practice score associated with decrease patients' pain score and good patients' outcome. ***Conclusion***: Non-pharmacological pain management for cardiothoracic surgery patients program significantly had a positive effect on nurses' knowledge, practice, and patients' pain severity level for patients with cardiothoracic surgery. ***Recommendation:*** Nurses should be encouraged to attend more training regarding pain assessment and non-pharmacological pain management for patients with cardiothoracic surgery..

Keywords: *Cardiothoracic surgery, Nursing performance, Non pharmacological pain management, and Patients' outcomes.*

Introduction

Cardiovascular diseases was responsible for the mortality of almost nine million people, making it the top cause of death globally. According to the most recent WHO statistics, coronary heart disease fatalities account for 32.40% of all deaths in Egypt, ranking the nation as the 15th highest in the world **(Ramadan et al., 2024).** Cardiothoracic surgeries are one of the most frequently applied surgical treatment methods in the world for reasons such as shortening the recovery period of patients and increasing the quality of life and life span compared to other treatment methods **(ÇAĞLAR & YEŞİLTEPE, 2021).**

The pain after open heart surgery adversely affects the quality of life of patients. Postsurgical pain after surgery, sub-optimal or untreated pain has profound impacts or negative effects on patients. **(Tola et al., 2023).**

The severity of the patients' pain should be evaluated not according to the size of the operation, but as the patient perceives the pain. The treatment of pain in patients after open heart surgery with non-pharmacological methods has an important place **(Reisli et al., 2021)**.

Although non-pharmacological methods do not replace pharmacological methods in relieving pain, they increase the success of pain treatment. Nonpharmacological interventions are essential to multimodal postoperative pain management and have been reported in the previous literatures to effectively relieve postoperative pain. Pain is a subjective finding reported by patients. However, it also adversely affects quality of life and recovery. It is, therefore, critical to use non-pharmacological methods to reduce pain in nursing care (**Yıldız, Oyuktaş & Avcu, 2024).**

Significance of the study

Cardiovascular diseases (CVD) are ranked first among all causes of death worldwide. Cardiovascular diseases is a rapidly expanding and severe public health issue. The global incidence of CVD is increasing. It is anticipated that the current prevalence rate of 1,655 per 100,000 population is expected to exceed 1,845 by the year 2030 **(Khalfallah et al., 2025).**

According to the Society of Thoracic Surgeons (STS), combinations of coronary artery bypass grafting, aortic valve replacement, mitral valve replacement, and mitral valve repair surgeries accounted for 79% of major cardiac procedures performed. While cardiac surgeries are increasingly common, they remain an emotional experience for patients (**Ng et al., 2022).**

Notably, non-pharmacological pain management is not clearly presented in the existing pain management in an enhanced recovery pathways because it lacks high-quality evidence to support its use. According to clinical practice guidelines, non-pharmacological interventions are considered as adjunctive therapies of pharmacological interventions for postoperative pain management **(Tola et al., 2023).** Therefore, the aim of the study was to evaluate the effect of non-pharmacological pain management program on nurses' performance and patient clinical outcomes undergoing cardiothoracic surgery.

Aim of the Study

The aim of this study was to evaluate the effect of non-pharmacological pain management program on nurses' performance and patient clinical outcomes undergoing cardiothoracic surgery through the following objective:-

1. Assess nurses' knowledge, and practice regarding non-pharmacological pain management for patient undergoing cardiothoracic surgery.
2. Assess cardiothoracic surgery patient's clinical outcomes pre and post non-pharmacological pain management.
3. Design, implement and evaluate the effect of non-pharmacological pain management program on nurses' knowledge, practice and patient's clinical outcomes undergoing cardiothoracic surgery.

Research hypothesis

This study will have three research hypotheses including:

H1- Nurses' knowledge regarding non-pharmacological pain management will be significantly improved after implementation of program compared to pre-program levels.

H2- Nurses' practices regarding non-pharmacological pain management will be significantly improved post implementation of program compared to pre-implementation levels.

H3- Patients' outcomes will be significantly improved post implementation of the non-pharmacological pain management program for

patients undergoing cardiothoracic surgery.

Research design; A quasi-experimental design with pre- and post-test. ***Setting*;** two postoperative cardiothoracic surgery department at Zagazig University Hospitals, which is composed of an open heart ICU and the Heart and chest ward. ***Subject*; For nurses;** Convenient sample of available nurses (35) nurses working in previously mentioned setting with **inclusion criteria;** Nurses with at least one year of experienced. While, **for patients;** Purposive sample of 35 patients undergoing cardiothoracic surgery, able to communicate, after weaning from mechanical ventilation, age ranged between 20-60 years and agrees to participate in the study. With **exclusion Criteria**: Patients with auditory deficits, psychological problems, sever cognitive impairment, received sedation, sever postoperative complications, patients on mechanical ventilation.

Tools for data collection:

The following tools was used to collect data in this study.

Tool I: A Structured Interview Questionnaire for Nurses **(Bader, Morsy, Ali 2015 / El husseiny et al., 2019):** - designed by the researcher after revising of related literature and include the following parts:

Part 1: Demographic characteristics of nurses

Part 2: Nurses' knowledge (Pre/ Post-test): This part was intended to assess nurses' knowledge regarding non-pharmacological pain management for patients with cardiothoracic surgery. It was developed by the researcher based on pertinent literature **(El husseiny et al., 2019)**, it was contained 47 MCQ questions and 33True and false questions

Scoring system for Nurses' interviewing questionnaire:

For the knowledge items, the correct answer was scored "1" and the incorrect "zero". For each area of knowledge, the scores of the items were summed-up and the total divided by the number of the items, giving a mean score for the area. These scores were converted into percent scores. The knowledge was considered satisfactory if the percent score was 75% or more and unsatisfactory if less than 75% based on data entering of the pilot study and statistical analysis.

Tool II; An Observational Checklist: it was developed by the researcher based on pertinent literature (**Ramadan, Mohamed, Abd Elsalem, 2018).** It covered the following areas of practice:

Part I; A-Nurses' practice regarding pain assessment: It was contained eight items.

Part II; Nurses' practice of non-pharmacological pain management methods: It was seven parts contained 131 items covered 135 steps

Scoring System for Observational Checklist

Each practice item observed to be done correctly was scored "one" and the not-done "zero". For each area of practice, the scores of the items were summed-up and the total divided by the number of the items, giving a mean score for the area. These scores were converted into percent scores. The practice was considered satisfactory if the percent score was 75% or more and unsatisfactory if less than 75% based on data entering of the pilot study and statistical analysis. Score more than 116 satisfactory done, less than 116 unsatisfactory practices.

Tool III; Patients Assessment Questionnaire: It had two parts as the following:

Part 1: It was concerned with Sociodemographic characteristics of patients

Part 2: It included postoperative patient's clinical outcome: this tool was developed by researcher after thorough review of literatures (**Shafshak, Tarek & Elnemr, 2021)**

Administrative Design and ethical consideration;

An official permission was obtained from the dean of the faculty of Nursing and from the director of Zagazig University Hospital before conducting the study. Additional written consents were taken from the patients who participated in the study after explaining its purpose. They were given an opportunity to refuse the participation, and they were assured that the information would be used for research purposes only.

Before the initial interview, each potential subject was informed about the nature, purpose, benefits of the study, and informed that his/her participation is voluntary. Confidentiality and anonymity of the subjects were also assured through coding of all data. The researcher assured that the data collected, and information will be confidential and would be used only to improve their knowledge and practice and for the purpose of the study. There was no risk in study subject during application of the research.

Pilot study

A pilot study for data collection was carried out in order to test whether the tools are clear, understandable, feasible, applicable, and time

consuming. Ten percent from the total sample size that equal five nurses' and five patients were selected randomly from intensive care units to participate in testing of the tools; these five nurses and patients were selected outside the original study sample which consisted of 35 nurses and 35 patients. The time required for answer questionnaire and complete observation chart was ranged between 30 to 40 minutes. Simple modifications was done based on pilot results and the sample who shared in the pilot study excluded from study sample.

Field work

After an official permission was taken from the dean of the faculty of Nursing, from the manager of Zagazig University Hospitals and from the head of cardiothoracic department, the implementation phase for data collection started as following: The selection of nurses and patients, the collection of data, and the implementation of the non-pharmacological pain management programs began from June 2024 to the end of April 2025 where the researcher was available three days weekly (Saturday, Sunday, and Thursday) during the morning and afternoon shifts. The non-pharmacological pain management programs were conducted through assessment, planning, implementation, and evaluation phases**.**

Assessment phase: Through this phase, the researcher secured all necessary permissions. The researcher visited th**e** study settings, met with the directors, and explained the aim of the study as well as the process of data collection to maintain their cooperation during data collection. The researcher then met with the nurses, explained to them the aim of the study and the process of collection of the data, and invited them to participate after being informed about their rights. In order to assess nurses' actual of knowledge and practice regarding non-pharmacological pain management, the researcher apply the study tools through one session (pre-test), The average time required for the completion of each tool was around 30-40 minutes.

Planning phase: Once the assessment phase was completed, the identified needs were translated to objectives; then the non-pharmacological pain management programs were designed by the researcher according to previously assessment that were obtained from the assessment phase. The program was designed for improving and updating knowledge, practice of nurses, and decrease patients' level of pain. It was designed as a booklet in a simple Arabic Language according to the last published and updated non-pharmacological pain management methods also based on experts' opinions and reviews of relevant literature (nursing textbooks, journals, internet periodicals, and magazines). Then each participant nurse had a copy of booklet.

Implementation phase: Through this phase, the developed non-pharmacological pain management programs were implemented in the form of sessions carried out in the study settings for nurses. The nurses had divided into small groups; each group contained 4-5 nurses. Non-pharmacological pain management programs were conducted by the researcher through "14" educational sessions (Five sessions for the theoretical part, and nine for the practical part), as the first session for orientation to clarify the aim and content of non-pharmacological pain management programs, its general objectives, the teaching methods, learner's activities, and evaluation methods. The next five sessions covered the theoretical part of the program, whereas the remaining nine sessions were for the practical part. These sessions were conducted during the morning and afternoon shifts.

Evaluation phase: Evaluation was done immediately post non-pharmacological pain management programs implementation and one month follow up. The evaluation was done to assess nurse's knowledge, practice, and patients' outcome, through comparing the results of the pre, post-tests to assess the effect of non-pharmacological pain management programs and the questionnaire were answered within 30 minutes, then collected.

Content validity

The tools were reviewed by a panel of one professors and four assistant professors in medical surgical nursing, faculty of nursing, Zagazig University to ensure their content validity. The tools were also reviewed for clarity, relevance, comprehensiveness, applicability, and understanding. According to the expertise's modifications and the results of the pilot study, some modifications were applied in the form of rephrasing or rewording accordingly.

Tools reliability

Nurses' knowledge practice and patient outcome were tested for reliability and showed high reliability through measuring its alpha Cronbach coefficient; (Nurses' knowledge was 0.845, Nurses' practice regarding non-pharmacological pain management

0.86, Patient Outcome was 0.785) indicating high reliability.

Statistical Design

All data were collected, tabulated and statistically analyzed using IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp. Quantitative data were expressed as the mean ± SD &median (range), and qualitative data were expressed as number & (percentage). Paired t test was used to compare between paired of abnormally distributed variables. Percent of categorical variables were compared using, Chi square test or Fisher Exact test when appropriate.

Mcnemar test was used to compare between paired categorical data. Marginal Homogeneity Test was used to compare between paired ordinal data. Pearson' correlation coefficient was calculated to assess relationship between various study variables, (+) sign indicate direct correlation and (-) sign indicate inverse correlation, also values near to 1 indicate strong correlation and values near 0 indicate weak correlation. All tests were two sided. P-value < 0.05 was considered statistically significant, p-value ≥ 0.05 was considered statistically insignificant. % of improvement = (after value – before value) / before value) * 100

Results;

Table 1 showed that more than half of studied nurses age ≥30 years (51.4) with median (range) 30 (22-51) with mean± SD=31.2±7.6 years, 74.3% of the studied nurses' were females and the majority of studied nurses were married (80.0%) and 62.9% of studied nurses residing in rural areas. Regarding nursing qualification, 42.9% of studied nurses had technical institute, 62.9% and 68.6% of studied nurses had experience less than 10 years in the nursing experience and cardiothoracic surgical department respectively. Related to the attendance of training courses, 62.9% and 57.1% respectively of studied nurses not attended previous training courses about pain assessment and non-pharmacological pain management methods.

Table 2 Illustrated that at the pre-intervention phase about only 5.7% of the studied nurses had satisfactory total knowledge level about non-pharmacological pain management for cardiothoracic surgery patients with mean± SD 36.4±11.01 and range from 14-61, while at the post–intervention phase about 85.7% of studied nurses had satisfactory total knowledge regarding non-pharmacological pain management for patients with cardiothoracic surgery with mean± SD 64.89±7.21 and range from 41-75. Also, it showed that there was a highly statistical significance difference between pre and post intervention with P. value 0.0001 with total knowledge improvement 78.26%.

Table 3 Revealed that there was increase in satisfactory total nurses' practice about non-pharmacological pain management for patients undergoing cardiothoracic surgery post intervention 82.9% with Mean ±SD 126.97±11.17 compared to pre intervention 11.4% with Mean ±SD 75.54±22.83 . Also, it showed a highly statistically significant differences in total nurses' practice about non-pharmacological pain management for patients undergoing cardiothoracic surgery pre and post intervention with P value 0.0001and total practice improvement 68.08%.

Table 4 Showed that more than two third of the patients (74.3%) aged below or equal 60 years, 77.1% of studied patients were male. As regards marital status 94.3% of the patients were married, 74.3% of patients were employed, 91.4 % of the patients were educated, slightly more than half of studied patients were smokers and had surgery (51.4%, 57.1%) respectively. Also, more than half of studied patients weren't use non-pharmacological methods. Furthermore 35.3% of studied patients who used non-pharmacological methods applied a cold compress.

Table 5 Revealed that there was improvement of pain score after using non-pharmacological pain management methods among patients undergoing cardiothoracic surgery post intervention compared to pre intervention (43.2%). Also, it showed that there was a highly statistically significant differences in Pain score after using non-pharmacological pain management methods among patients undergoing cardiothoracic surgery pre, post intervention with P value was 0.0001.

Table 6 Showed that there was no significant association between knowledge level and outcome (p = 0.586) or practice level and outcome (p = 0.162). However, pain severity showed a statistically significant association with outcome (χ^2 = 10.881, p = 0.004), with severe pain being more common among patients with poor outcomes.

Discussion;

Regarding studied nurses' knowledge. The post-intervention phase showed highly statistically significant (p=0.0001). This improvement is further reflected in the increase in the mean knowledge score, which rose from 36.4±11.01 pre-educational program to 64.89±7.21 post-educational program. This finding concurred with **Khawaja et al., (2025)** showed that following the educational intervention, nurses' mean knowledge scores improved significantly from three fifths of studied nurse (SD 8.9) at baseline to three quarters of studied nurses (SD 9.2) post-intervention, $p < 0.001$). This substantial and statistically significant improvement demonstrates the effectiveness of the intervention in enhancing theoretical knowledge regarding postoperative pain management.

On the other hand, this finding contradicted with **Liu et al., (2021),** who carried out a study entitled "Implementation and evaluation of a pain management core competency education program for surgical nurses." and found that the knowledge level of nurses regarding pain management was so low that improvements were needed. Before the education program, scores of the multidimensional aspect of pain, pain assessment and measurement, and management of pain were relatively low. After education, scores of these three domains were still low.

The current study found that there was statistically different increase in satisfactory and improvement of total nurses' practice regarding non-pharmacological pain management for patients undergoing cardiothoracic surgery, that increased from one tenth of studied nurses had satisfactory practices that increased to majority of studied nurses in post educational program with P value 0.0001.

These results supported by the results of **Alomari et al., (2024)** who showed that nurses' practice regarding assessment and management of patients with pain has improved approximately majority of studied nurses reached a satisfactory level after immediate exposure to educational programs. This finding may be related to the fact that well-structured in-service training sessions are able to improve nurses' practice. This finding also consistent with **Tsegaye et al., (2023),** showed that more than two fifths of nurses had a good practice on non-pharmacological pain management practice.

This finding is incongruent with **Zeleke, Kassaw & Eshetie (2021),** who carried out a study entitled "Non-pharmacological pain management practice and barriers among nurses working in Debre Tabor Comprehensive Specialized Hospital, Ethiopia" and showed that only one fifth of studied nurses had a good practice on non-pharmacological pain management practice.

The current study Showed that more than two third of the patients aged below or equal 60 years, more than three quarters of studied patients were male. As regards marital status most of the studied patients were married, about three quarters of studied patients were employed, most of the studied patients were educated, more than half of studied patients were smokers and had surgery respectively. Also, more than half of studied patients weren't use non-pharmacological methods. Furthermore about two fifths of studied patients who used non-pharmacological methods applied a cold compress.

This finding supported with **Ali et al., (2024),** who carried out a study entitled "Dyspnea, Fatigue and Sleep Quality Post Cardiac Surgeries: Effect of Selected Relaxation Techniques", and Showed that more than two fifths of the studied patients' age ranged from 40 – 49 years, and more than one fifth of studied patients had more than 60 years age. On the other hand three fifth of studied patients were males, three fifths of the studied patients were employed, more than three fifths of the studied patients had a history of smoking or active smokers and more than half had previous surgery, also mentioned that non-pharmacological interventions are very safe and do not require expensive equipment

This finding was in disagreement with **Hamad, Ragab & Zytoon (2024),** who carried out a study entitled "Effect of Non-Pharmacological Nursing Interventions on Fatigue, Pain and Quality of Life for Patients with Systemic Lupus Erythematosus", and demonstrates that greater than one quarter of the study sample their ages between thirty to forty years old with mean age ± 32.3. The presently results regarding sex showed that most of the patients were married women. Also, showed that majority of studied patients were house wives (no working).

The current study showed that there was Improvement of pain score after using non-pharmacological pain management methods among patients undergoing cardiothoracic surgery post

intervention compared to pre intervention. Also, it showed that there was a highly statistically significant differences in Pain score after using non-pharmacological pain management methods among patients undergoing cardiothoracic surgery pre, post intervention with P value was 0.0001.

This finding consistent with **Soh et al., (2024),** who carried out a study entitled "Effectiveness of non-pharmacological interventions in improving sleep quality after cardiac surgery: A systematic review and meta-analysis." and showed that The usage of non-pharmacological interventions revealed overall significant improvement in pain intensity and anxiety outcomes among patients after cardiac surgery. This finding also consistent with **Silva et al., (2024)**, who showed that statistical significance in pain relief in patients who underwent heart surgery and received inhalation with Lavandula angustifolia as type of non-pharmacological pain management.

On the other hand, this finding contradicted with **Boitor et al., (2019),** who found that hand massage were shown to be ineffective when considering the sustained effects as pain management method as well as when compared to pharmacological pain management interventions.

The current study Showed, there was a significant direct association between post intervention knowledge with post intervention practice among studied nurses. Whereas there was a significant inverse association between post intervention knowledge score, post intervention practice score among studied nurses and patients pain score. Meaning increase both nurses knowledge score, post intervention practice score associated with decrease patients' pain score. Also pain severity showed a statistically significant association with outcome (χ^2 = 10.881, p = 0.004), with severe pain being more common among patients with poor outcomes.

This finding agreed with **Jarelnape et al., (2024),** who carried out a study entitled "The influence of nursing interventions on patient outcomes: a systematic review", and reported that pain management interventions for nurses, such as the use of non-pharmacological interventions and patient controlled analgesia, increase both nurses knowledge score, post intervention practice score resulted in a reduction in pain intensity and improved patient satisfaction with good outcomes.

Conclusion;

Educational program had a significant positive impact on nurses' knowledge and practices regarding non-pharmacological pain management for patient undergoing cardiothoracic surgery which was reflected in improved patient outcomes,

Recommendations;

Based on the current study results, the following recommendations were suggested:

1- Encourage more periodical continuing in service education for nurses that empowering more successive utilization of non-pharmacological methods in cardiothoracic department for patient undergoing cardiothoracic surgery

2- Simple illustrated Arabic booklets about non-pharmacological techniques to alleviate pain should be accessible in all cardiothoracic surgery department.

3- Hospital managers should motivate and support nurses in using non-pharmacological techniques inside the cardiothoracic surgery department.

4- Replication of this study with a larger sample size at various cardiothoracic surgery department in order to generalize the results

References

Ramadan, A., Soliman, M. A., Hamad, A. A., El-Samahy, M., Roshdy, M. R., Diab, R. A., & Almalki Sr, M. E, (2024): Cardiovascular disease and stroke risk among Egyptian resident physicians: A cross-sectional multicenter study. Cureus; 16(4): pp.17-25.

ÇAĞLAR TUNCER, M., & YEŞİLTEPE OSKAY, Ü, (2021): Açık Kalp Cerrahisinin Kadın Cinsel Fonksiyonuna Etkisi ve Cinsel Danışmanlık. Journal of Hacettepe University Faculty of Nursing; 8(3): pp.217-223.

Tola, Y. O., Chow, K. M., Liang, W., Ilesanmi, E., Olarinde, O. C., & Odejobi, D. B, (2023): Non-Pharmacological Management of Acute Pain after Breast and Thoracic Surgery. In Topics in Postoperative Pain. IntechOpen; 3(1): pp.3456-3467.

Reisli, R., Akkaya, O., ARICAN, Ş., Can, O., Cetingok, H., Güleç, M., & Talu, G, (2021): Pharmacologic treatment of acute postoperative pain: A clinical practice guideline of The Turkish Society of Algology. AGRI-THE JOURNAL OF THE TURKISH SOCIETY OF ALGOLOGY; 33(1): pp.1478-1485.

Yıldız, T., Oyuktaş, M., & Avcu, Ç, (2024): The effect of non-pharmacological methods on pain in patients undergoing open heart surgery: A systematic review and meta-analysis. Turkish Journal of Thoracic and Cardiovascular Surgery; 32(3): pp.291.

Khalfallah, M., Habib, M., Kishk, A. M., Saeed, B., Hemdan, S., Eissa, A & Elnagar, B, (2025): Atherosclerotic Cardiovascular Diseases in Middle Delta of Egypt: A Systematic Analysis of Risk Factors Associated with the Rising Burden of the Disease. Global Heart; 20(1): pp.11-21.

Ng, S. X., Wang, W., Shen, Q., Toh, Z. A., & He, H. G, (2022): The effectiveness of preoperative education interventions on improving perioperative outcomes of adult patients undergoing cardiac surgery: a systematic review and meta-analysis. European Journal of Cardiovascular Nursing; 21(6): pp.521-536.

Badr M N, Morsy W Y & Ali N S, (2015): Critical care nurses' knowledge and practices regarding Pain assessment and management at Cairo University Hospitals. Egyptian Journal of Nursing; 10(1): pp.46-64.

El-husseiny H S, Khalil A, Abed-Ella N H & Mohamed N R, (2019): Impact of an Educational Program on Pediatric Nurses Knowledge Regarding Non-Pharmacological Pain Management in Neonatal Intensive Care Units. Port Said Scientific Journal of Nursing; 6(3): pp.68-84.

Ramadan Ali Khalifa D, Mohammed W Y & Abd ElSalam Seloma Y., (2018): Nurses' Knowledge and Practices about Management of Acute Pain among Injured Persons at Kafr El Sheikh General Hospital. Egyptian Journal of Health Care; 9(2): pp.24-33.

Shafshak, Tarek S., & Elnemr, R. (2021): The visual analogue scale versus numerical rating scale in measuring pain severity and predicting disability in low back pain. JCR: Journal of Clinical Rheumatology; 27(7): pp.282-285.

Khawaja, Q., Sarwar, H., Khalid, H., Azam, S., & Noor, H, (2025): Knowledge and Clinical Practice of Nurses for Postoperative of Orthopedic Patients for Pain Management. Journal of Health, Wellness and Community Research; 13(3): pp.473-473.

Liu, X., Li, L., Wang, L., Herr, K., & Chen, Q, (2021): Implementation and evaluation of a pain management core competency education program for surgical nurses. International journal of nursing sciences; 8(1): pp.51-57.

Alomari, H., Mary Edward Reizian, A., Abdel Fattah Mohamed, M., Yousef Al-Husban, R., & Adel Abd El-Aty, M, (2024): Effect of an Educational Program on nurses' performance level about Pain Assessment and Management. Alexandria Scientific Nursing Journal; 26(1): pp. 28-38.

Tsegaye, D., Yazew, A., Gedfew, M., Yilak, G. & Yalew, Z, (2023): 'Non-Pharmacological Pain Management Practice and Associated Factors among Nurses Working at Comprehensive Specialized Hospitals'. SAGE Open Nursing; 9(1): pp.23779608-231158979.

Zeleke, S., Kassaw, A., & Eshetie, Y, (2021): Non-pharmacological pain management practice and barriers among nurses working in Debre Tabor Comprehensive Specialized Hospital, Ethiopia. Plos one; 16(6): pp.0253086.

Ali Ahmed, A., Ali Mohamed, A., Hussein Khalil, E., N Besely, W., & M Abedelbaky, M. (2024): Dyspnea, Fatigue and Sleep Quality Post Cardiac Surgeries: Effect of Selected Relaxation Techniques. Egyptian Journal of Health Care; 15(2): pp.1803-1815.

Hamad, A. H., Ragab, I. I., & Zytoon, H. K, (2024): Effect of Non-Pharmacological Nursing Interventions on Fatigue, Pain and Quality of Life for Patients with Systemic Lupus Erythematosus. Zagazig Nursing Journal; 20(1): pp.406-420.

Soh, P. Q. P., Wong, W. H. T., Roy, T., & Tam, W. W. S, (2024): Effectiveness of non-pharmacological interventions in improving sleep quality after cardiac surgery: A systematic review and meta-analysis. Journal of Clinical Nursing; 33(6): pp.2084-2098.

Silva, L. C. D. M. A., Dos Santos, K. V. G., Dos Santos, J. J. D. S., Arruda, R. P. D. P. O., e Silva, S. Y. B., Silva, H. M. M. D., & Dantas, R. A. N, (2024): Efficacy of aromatherapy with Lavandula angustifolia oil on postoperative pain after cardiac surgery: A randomized clinical trial. EXPLORE; 20(6): pp.103034.

Boitor, M., Martorella, G., Maheu, C., Laizner, A. M., & Gélinas, C, (2019): Does hand massage have sustained effects on pain intensity and pain-related interference in the cardiac surgery critically ill? A randomized controlled trial. Pain Management Nursing; 20(6): pp.572-579.

Jarelnape, A. A., Ali, Z. T., Fadlala, A. A., Sagiron, E. I., Osman, A. M., Abdelazeem, E., ... & Albagawi, B, (2024): The influence of nursing interventions on patient outcomes: a systematic review. Saudi Journal of Health Systems Research; 4(1): pp.1-7.

Table (1): Frequency and percentage distribution of demographic characteristics of the studied nurses (n.35):

Nurses' demographic characteristics	No.	%
Age per years		
<30 years	17	48.6
≥30 years	18	51.4
Mean ±SD	**31.2±7.6**	
median(range)	30(22-51)	
Sex		
Males	9	25.7
Females	26	74.3
Marital status		
Married	28	80.0
other	7	20.0
Residence		
Urban	13	37.1
Rural	22	62.9
Nursing qualification:		
Nursing diploma	11	31.4
Nursing technical institute	15	42.9
Nursing Bachelors	7	20.0
Diploma +specialty	2	5.7
Nursing experience in nursing field		
<10 years	22	62.9
≥10 years	13	37.1
Mean ±SD	**10.22±8.15**	
median(range)	8(1-32)	
Experience years in cardiothoracic surgical departments:		
<10 years	24	68.6
≥10 years	11	31.4
Mean ±SD		
median(range)	**16.05±4.71** 16(5-25)	
Attended training courses about pain assessment		
yes	13	37.1
No	22	62.9
Attended training courses about non-pharmacological pain management methods		
yes	15	42.9
No	20	57.1

Table 2: Frequency and percentage distribution of correct total of nurses' knowledge about non-pharmacological pain management for patients undergoing cardiothoracic surgery at pre and post intervention program (n= 35):

Correct total of nurses' knowledge	Total nurses 'knowledge				% Improvement	Paired t	P-value
	Pre intervention		Post intervention				
	No	%	No	%			
Total correct nurses' knowledge					78.26	17.66	0.0001*
Satisfactory ≥ 75%	2	5.7	30	85.7			
Unsatisfactory ≤ 75%	33	94.3	5	14.3			
Mean ±SD	**36.4±11.01**		**64.89±7.21**				
Median(range)	38(14-61)		67(41-75)				

()# = maximum score, Paired t Test, *p<0.05= significant

Table 3: Frequency and percentage distribution of correct total of nurses' done practices about non-pharmacological pain management for patients undergoing cardiothoracic surgery at pre and post intervention program (n= 35):

Total of nurses' done practices	Total nurses' practices				% Improvement	Paired t	P-value
	Pre intervention		Post intervention				
	No	%	No	%			
Total nurses' practices					68.08%	14.49	0.0001*
Satisfactory ≥ 75%	4	11.4	29	82.9			
Unsatisfactory ≤ 75%	31	88.6	6	17.1			
Mean ±SD	**75.54±22.83**		**126.97±11.17**				
Median(range)	67(47-133)		128(83-142)				

()# = maximum score, Paired t Test, *p<0.05= significant

Table 4: Frequency and percentage distribution of patients' demographic characteristics undergoing cardiothoracic surgery (n.35):

Patients' demographic characteristics	No.	%
Age group		
≤60	26	74.3
>60	9	25.7
Sex		
Males	27	77.1
Females	8	22.9
Marital status		
Married	33	94.3
Unmarried	2	5.7
Job		
Working	26	74.3
Retirement	9	25.7
Education	.	.
Educated	32	91.4
Not educated	3	8.6
Smoke	.	.
Smokers	18	51.4
Non smoker	17	48.6
Surgery	.	.
Yes	20	57.1
No	15	42.9
Treatment by non-pharmacological methods previously	.	.
Yes	17	48.6
No	18	51.4
Types of non-pharmacological methods used previously	.	.
Applying a warm compress	2	11.7
Applying a cold compress	6	35.3
Performing a back massage	5	29.5
Performing relaxation techniques	4	23.5

Table 5: Improvement of pain score after using non-pharmacological pain management methods among patients undergoing cardiothoracic surgery (n.35):

Pain score	Pre		Post		Paired t	% of improvement	P-value
	No.	%	No.	%			
Pain level					11.54	43.2%	0.0001*
Mild	0	0.0	13	37.1			
Moderate	12	34.3	19	54.3			
Sever	23	65.7	3	8.6			
Pain score							
Mean ±SD	7.4±1.6		4.2±1.8				
Median(range)	7(4-10)		4(1-8)				

Paired t test, $p<0.05$ significant

Table 6: Relation between post-operative Patients outcome and nurses' knowledge, practice and patients' pain severity (n.35):

Variables	Patients outcome				χ^2	p-value
	Good <50.0% n.26		Bad ≥50.0% n.9			
	No.	%	No.	%		
Nurses' knowledge level about non-pharmacological pain management post intervention						
Satisfactory	23	88.5%	7	77.8%	f	0.586
Unsatisfactory	3	11.5%	2	22.2%		
Nurses' practice level in non-pharmacological pain management post intervention						
Satisfactory	23	88.5%	6	66.7%	f	0.162
Unsatisfactory	3	11.5%	3	33.3%		
Patients' Pain severity	.					
Mild	12	46.2%	1	11.1%		
Moderate	14	53.8%	5	55.6%	10.88	0.004*
Severe	0	00	3	33.3%		

χ^2 Chi square test , Fisher exact test, non-significant $p \geq 0.05$, significant $p < 0.05$