# Determining Multimodal Analgesia Knowledge Level of Nurses who Work in Neurosurgery Clinics

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**Abstract**

**Background:** Methods for relieving pain after neurosurgical surgery, requires intervention at all stages of patient care. Multimodal analgesia, which is the gold standard in the management of pre/pre/postoperative pain, is an approach that reduces opioid consumption, controls side effects, and improves overall outcomes.

**Aim:** The aim of the study is to determine the knowledge level of nurses working in neurosurgery clinics about multimodal analgesia.

**Methodology:** The sample of the descriptive-cross-sectional study consisted of 74 nurses working in the neurosurgery clinics of a training and research hospital between 20 September and 20 October 2022. Data were collected using a descriptive specification form and an information form consisting of 30 questions including information questions for multimodal analgesia. Institutional and ethical committee permissions were obtained before starting the study. SPSS 25 package program was used in the analysis of the data.

**Results:** Of the nurses who participated in the study, 62.2% (n=46) reported that they did not have enough information about multimodal analgesia, and 66.2% (n=49) did not have enough information about analgesic drugs. The mean correct response score for multimodal analgesia was found to be 21.74±5.129 (8-29). A statistically significant difference was found between the knowledge levels of nurses about multimodal analgesia, their previous knowledge about multimodal analgesia, and the education levels of nurses (p<0.05).

**Conclusion:** As a result of the study, it was determined that although most of the nurses thought that they did not have enough knowledge about multimodal analgesia and stated that they did not use multimodal analgesia methods in their clinics, their knowledge score averages were  higher than expected.

**Key words:** Neurosurgery, Nurses, Multimodal Treatment, Pain, Knowledge,

## Introduction

Pain, which is a multidimensional and complex phenomenon, emerges as a subjective response to physical and psychological stressors. Pain is the most important reason that reduces the quality of life of the individual and directs the individual to health professionals. According to the definition made by the International Association for the Study of Pain (IASP), pain is "an unpleasant emotional sensation, a behavior pattern, originating from a certain part of the body, related or not due to tissue damage, affected by the past experiences of the individual" (Cavdar & Akyuz, 2020). Pain sensation occurs as a result of electrical and

chemical events in the peripheral and central nervous systems. The result of these electrical and chemical events is perceived by the individual as pain. Pain, by its nature, is a condition that needs to be constantly evaluated and managed (Doggweiler et al., 2017).

Post-operative pain is defined as pain that starts with surgical trauma and ends with gradually decreasing tissue healing, is relatively short-term, usually well localized, and is directly related to the type and width of the incision as well as the degree of surgical trauma. Postoperative pain is usually caused by tissue damage, surgical drains and postoperative complications (Seyhan Ak, 2020). Inadequate pain control negatively affects quality of life and functionality (Chou et al., 2016). This increases the risk of postoperative complications and the incidence of post-operative chronic pain. Since the patient's response to pain is unique, pain should be evaluated individually. Effective pain management is a critical component in the post-operative process. The key to postoperative pain control is the selection of appropriate pain management (Chou et al., 2016).

Therefore, it is critical to examine the multimodal analgesia knowledge level of nurses working in neurosurgery clinics.

## Background

Neurosurgical interventions, craniotomies for tumor resection, epilepsy surgery, penetrating traumatic brain injury, arteriovenous embolization attempts and also neuroradiological interventions may cause postoperative pain. Postoperative hematomas, elevated intracranial pressure, cerebral infarctions, seizures, hypertension, development of air embolism, cranial nerve damage, cerebral edema and paralysis may complicate the management of postoperative pain (Vadivelu et al., 2016). Mordhorst et al. (2010) found that 55% of patients experienced moderate to severe pain within the first 24 hours after craniotomy. Vadivelu et al. (2016) reported that pain was experienced most frequently in the first 48 hours after the intervention, especially 32% of the patients continued to feel pain after the first 48 hours, and the highest incidence of pain was in young women and in patients using opioids in

the preoperative period. Despite the improvements in pain control, possible side effects such as sedation, respiratory depression, worsening of intracranial pressure, hypercapnia, nausea and vomiting may cause problems in neurosurgery patients. Moreover, this may affect the neurological evaluation. Postoperative pain management is very important as it prevents functional recovery after surgery. Standardization of pain management is an important factor in improved recovery protocols (Panda et al., 2019). Methods for relieving pain after neurosurgical surgery require intervention at all stages of patient care. Multimodal analgesia, which is the gold standard in the management of pre/postoperative pain, is an approach that reduces opioid consumption, controls side effects, and improves overall outcomes (Vacas & Wiele, 2017) The conventional approach with low-dose opioids is often inadequate and can cause well-known side effects. Multimodal analgesic approaches are reported beneficial. Combined use of multiple non-opioid analgesics to achieve better pain control and reduction of opioid administration while preserving clinical neurological examination (Ban et al., 2019).

Multimodal analgesia includes drugs such as local anesthetic, non-steroidal anti-inflammatory, opioid, paracetamol, as well as anxiolytic, neuroleptic, anticonvulsant and antidepressant group drugs called adjuvants. Non-pharmacological methods are used to reduce the side effects by reducing the dose of drugs and to increase the effect in terms of integrating the most preferred pharmacological treatment method for pain relief due to its quick effect and easy application (Senyuz & Kocasli, 2017). In the non-pharmacological pain approach methods such as; distraction, listening to music, relaxation techniques, imagination, breathing techniques, biological feedback, meditation, cognitive and behavioral methods including hypnosis, hot/cold applications, massage, positioning, transcutaneous electrical nerve stimulation, acupuncture, touch therapy, reassurance are applied (Acar et al., 2016; Ay & Alpar, 2010; Ozveren, 2011;).

Recommendations for pain management after neurosurgical surgery focus on the use of multimodal analgesic methods and the reduction of opioid use. Potters and Klimek

(2018) stated in their review that local infiltration of the surgical field or application of direct nerve/scalp block is an effective method in reducing postoperative pain in patients undergoing craniotomy for brain tumor resection. It is necessary to determine the level of knowledge and see applications of nurses on patient education, pain assessment, accurate recording of results, pharmacodynamic properties of painkiller classes, possible side effects, lack of knowledge about pharmacological and non-pharmacological pain approaches. An awareness should be created in line with the results (Colpan, 2021). In this respect, it is necessary for nurses to follow all current developments regarding pain and to raise awareness about the roles and responsibilities of nurses by organizing in-service trainings. In this direction, the aim of the study is to examine the knowledge levels of nurses working in neurosurgery clinics regarding multimodal analgesia methods, to increase nurses' awareness on this topic and to contribute to the literature.

**Research Questions**

1.      What are the descriptive characteristics of nurses working in neurosurgery clinics?
2.      What is the knowledge level of nurses working in neurosurgery clinics about multimodal analgesia?
3.      What is the relationship between the descriptive characteristics of nurses working in neurosurgery clinics and their knowledge levels about multimodal analgesia?

**Methodology**

**Study type and aim:** This study was conducted as a descriptive-cross-sectional study to determine the knowledge levels of nurses working in neurosurgery clinics about multimodal analgesia.

**Place and time of the study:** This study was conducted in the neurosurgery clinics of a Training and Research Hospital in Istanbul between September 20 and October 20, 2022.

**Population and sample of the study:** The population of the study consisted of 90 nurses working in the neurosurgery clinics of a Training and Research Hospital in Istanbul between September 20 and October 20, 2022. The sample was calculated as 73 people according to the sampling method with

known population. The study was completed with 74 nurses.

**Inclusion criteria for the study:** Nurses who were not on leave or on a medical report during the date of the study and were willing to participate in the study were included in the study.

**Data collection tools:** The data of the study were collected using a 30-item questionnaire, which was prepared by the researchers based on the literature (Cok et al., 2011; Colpan, 2021; Donahue et al., 2018; Jafra & Mitra, 2018; Jarzyna et al., 2011; Midilli et al., 2019; Naqib et al., 2018; Ozveren et al., 2018; Senyuz & Kocasli, 2017; Small & Laycock, 2020; Perdreau, 2015; Yilmazlar, 2013), including the descriptive features form and information questions about multimodal analgesia.

**Data collection:** Before starting the research, a pilot study was conducted with 5 nurses to test the intelligibility of the questions. Nurses included in the pilot study were excluded from the sample. The data were collected by face-to-face interview method accompanied by the researcher. The study was initiated after obtaining informed consent on the neurosurgery nurses' working day, during a time that would not interfere with the workflow. A questionnaire containing nurses' introductory characteristics and a form evaluating nurses' knowledge level about multimodal analgesia were used respectively.

**Evaluation of data:** IBM SPSS Statistics 25 program was used to evaluate the research data. Mean standard deviation, median, minimum and maximum values were given in descriptive statistics for continuous data, and number and percentage values were given in discrete data. The Kolmogorov Smirnov test was used to examine the conformity of the determining scores of the knowledge levels to the normal distribution  about multimodal analgesia, and the p value was found to be less than 0.05 ($p<0.05$). In the comparison of nurses' sociodemographic characteristics and knowledge index scores; Mann Whitney U test was used to compare variables with 2 groups, and Kruskal Wallis analysis of variance was used to compare variables with more than two groups. The statistical significance limit was evaluated as $p<0.05$.

**Ethical approach:** Ethics Committee approval (19.09.2022 / 2022-18-09) and institutional permission were obtained before

starting the research. Informed consent was obtained from the nurses who agreed to participate in the study.

## Results

The mean age of the nurses participating in the study was 31±8.286 (21-53).  It was determined that 81.1% of the nurses participating in the research were women, 73% of them are Bachelor's degree holders and 50% of them had 5 years or more nursing experience. It was observed that 62.2% of the nurses did not have knowledge about multimodal analgesia. 63.5% of the nurses reported that multimodal analgesia was not applied in the clinic where they worked, mostly due to not having enough knowledge about multimodal analgesia (21.6%). It was determined that 62.2% of the nurses applied pain relief accurately and effectively in the clinic where they worked, and mostly (55.4%) applied analgesic treatment in the form of "combination of opioid, non-steroidal anti-inflammatory and paracetamal group drugs" (Table 1).

When the form used to determine the level of knowledge about multimodal analgesia is examined; the most correct answer (98.6%) by the nurses was found "Pain can cause complications with the stress it creates in the body", and the most incorrect answer (71.6%) was found "As the effect level of the drugs increases in the multimodal analgesia method, there may be an increase in the side effects that can be seen in the patient" (Table 2). It was found that the mean correct response score of nurses for multimodal analgesia was 21.74± 5.129 (8-29) (Table 3).

It was determined that; there was a statistically significant difference in the comparison of nurses' knowledge about multimodal analgesia and their previous knowledge about multimodal analgesia (p<0.05), but there was no statistical significance in the comparison of multimodal analgesia administration, knowledge about analgesics and pain assessment between knowledge levels about multimodal analgesia in the clinics where they worked in (p>0.05) (Table 4).

There was a statistically significant difference between the knowledge levels of nurses about multimodal analgesia and their educational status (p<0.05); thus there was no statistically significant difference in the comparison of the working years and knowledge levels of the nurses (p>0.05) (Table 5).

**Table 1. Descriptive characteristics of nurses working in neurosurgery clinics (N=74)**

| Features | n | % |
|---|---|---|
| **Sex** | | |
| Woman | 60 | 81.1 |
| Male | 14 | 18.9 |
| **Educational Status** | | |
| Vocational High School of Health | 6 | 8.1 |
| Bachelors | 54 | 73.0 |
| Postgraduate | 14 | 18.9 |
| **Working Years** | | |
| 0-1 year | 17 | 23.0 |
| 1-5 years | 20 | 27.0 |
| 5 years or more | 37 | 50.0 |
| **State of Knowledge on Multimodal Analgesia** | | |
| Knowledgeable | 28 | 37.8 |

| | | |
|---|---|---|
| Not knowledgeable | 46 | 62.2 |
| **Source of Information on Multimodal Analgesia** | | |
| In-service training | 6 | 8.1 |
| Congress or conference | 8 | 10.8 |
| Other | 14 | 18.9 |
| **Application of Multimodal Analgesia in the Clinic** | | |
| Multimodal analgesia is applying | 27 | 36.5 |
| Multimodal analgesia is not applying | 47 | 63.5 |
| **Barriers to the Application of Multimodal Analgesia** | | |
| Intense work Schedule | 10 | 13.5 |
| Insufficient knowledge about multimodal analgesia | 16 | 21.6 |
| Having another routinely applied analgesia protocol | 13 | 17.6 |
| Other | 8 | 10.8 |
| **Status of Pain Assessment and Follow-up in the Clinic** | | |
| Pain assessment and follow-up are applied correctly and effectively | 46 | 62.2 |
| Inadequacies in pain assessment and follow-up | 28 | 37.8 |
| **Barriers to Pain Assessment and Follow-up** | | |
| Insufficient knowledge of pain assessment | 3 | 4.0 |
| Problems experienced in the follow-up of pain | 2 | 2.7 |
| Intense work Schedule | 9 | 12.2 |
| High number of patients per nurse | 10 | 13.5 |
| Insufficient knowledge about analgesic treatment and follow-up | 3 | 4.0 |
| Other | 1 | 1.4 |
| **Analgesia Treatment Applied in the Clinic** | | |
| Only paracetamol group drugs | 3 | 4.0 |
| Only non-steroidal anti-inflammatory drugs | 0 | 0 |
| Only opioid drugs | 0 | 0 |
| Paracetamol and non-steroidal anti-inflammatory drugs | 11 | 14.9 |
| Opioid and non-steroidal anti-inflammatory drugs | 8 | 10.8 |
| Opioid and paracetamol group drugs | 11 | 14.9 |
| Combination of opioid, non-steroidal anti-inflammatory and paracetamol group drugs | 41 | 55.4 |

**Table 2. Distribution of neurosurgery nurses' responses to multimodal analgesia (N=74)**

| Items | True n (%) | False n (%) |
|---|---|---|
| Pain is a negative experience that includes biopsychosocial components and progresses in the same stages for each individual. | 42 (56.8) | 32 (43.2) |
| Pain assessment should be made multidimensional to determine the cause, enhancing factors, reducing factors, localization, type and severity. | 70 (94.6) | 4 (5.4) |
| When acute pain management is inadequate, it can turn into chronic pain. | 68 (91.9) | 6 (8.1) |
| Pain can cause complications with the stress it creates in the body. | **73 (98.6)** | **1 (1.4)** |
| Since pain blocks the patient from breathing and coughing effectively, it can lead to respiratory complications such as atelectasis and pneumonia. | 70 (94.6) | 4 (5.4) |
| Since pain limits the patient's mobilization, it may cause thromboembolic complications. | 70 (94.6) | 4 (5.4) |
| Pain can cause complications in the cardiovascular system such as arrhythmia, hypertension, and tachycardia. | 63 (85.1) | 11 (14.9) |
| Worsening prognosis, prolongation of hospital stay and increased cost, develop as a result of inadequacies in pain management. | 64 (86,5) | 10 (13,5) |
| When the pain is not controlled, it causes a delay in wound healing. | 52 (70.3) | 22 (29.7) |
| World Health Organization analgesia ladder steps should be applied according to the patient's current clinical features and comorbid diseases. | 58 (78,4) | 16 (21,6) |
| Paracetamol group drugs are not preferred due to their low efficacy, although they are safe in terms of side effects that may occur in the patient. | 39 (52.7) | 35 (47.3) |
| Paracetamol group drugs should be used together with non-steroidal anti-inflammatory drugs (NSAIDs) when their effect is not sufficient. | 52 (70.3) | 22 (29.7) |
| Paracetamol treatment should be administered by controlling the patient's liver function tests. | 56 (75.7) | 18 (24.3) |

| | | |
|---|---|---|
| Instead of applying a routine analgesic treatment, the patient's pain severity should be expected to increase for treatment. | 36 (48.6) | 38 (51.4) |
| The use of non-steroidal anti-inflammatory drugs (NSAIDs) should be rearranged in patients with renal failure, severe gastric ulcer, and a history of gastric bleeding. | 58 (78.4) | 16 (21.6) |
| Multimodal analgesia has no effect on bowel functions in the postoperative period. | 49 (66.2) | 25 (33.8) |
| Multimodal analgesia contributes to the early mobilization of the patient. | 55 (74.3) | 19 (25.7) |
| The first choice in multimodal analgesia is the use of long-acting opioids. | 49 (66.2) | 25 (33.8) |
| Since the severity of pain may vary in patients with a history of chronic opioid use, the opioid dose should be adjusted carefully and individually. | 59 (79.7) | 15 (20.3) |
| Multimodal analgesia is part of the Enhanced Recovery After Surgery (ERAS) protocol. | 44 (59.5) | 30 (40.5) |
| In multimodal analgesia, the synergistic effect of drugs is utilized. | 44 (59.5) | 30 (40.5) |
| Paracetamol, non-steroidal anti-inflammatory, opioid and adjuvant group analgesics are included in multimodal analgesia. | 48 (64.9) | 26 (35.1) |
| As the effect level of the drugs increases in the multimodal analgesia method, there may be an increase in the side effects that can be seen in the patient. | **21 (28.4)** | **53 (71.6)** |
| In multimodal analgesia, drugs are administered in high doses in combination. | 55 (74.3) | 19 (25.7) |
| Multimodal analgesia is based on a holistic approach. | 55 (74.3) | 19 (25.7) |
| When patient-controlled analgesia is preferred in multimodal analgesia, the drug dose should be adjusted carefully. | 67 (90.5) | 7 (9.5) |
| Each treatment plan is different in multimodal analgesia, | 61 (82.4) | 13 (17.6) |
| The use of multimodal analgesia shortens the hospitalization period of the patient. | 57 (77.0) | 17 (23.0) |
| Non-pharmacological methods such as hot-cold application, transcutaneous electrical nerve stimulation (TENS) can be used additionally in multimodal analgesia. | 48 (64.9) | 26 (35.1) |
| Anxiolytic, neuroleptic, anticonvulsant and antidepressant group drugs are definitely not included in multimodal analgesia. | 28 (37.8) | 46 (62.2) |

**Table 3. Knowledge level distribution of multimodal analgesia (N=74)**

|  | x̄±SD | Min | Max |
|---|---|---|---|
| **Multimodal Analgesia Total Knowledge Score** | 21.74±5.219 | 8 | 29 |

**Table 4. Comparison of the knowledge levels of neurosurgery nurses with "knowledge-application-pain states about multimodal analgesia and analgesics" (N=74)**

| Variables | | Knowledge Levels of Multimodal Analgesia | | | |
|---|---|---|---|---|---|
| | | N | Mean Rank | U | p |
| State of Knowledge on Multimodal Analgesia | Knowledgeable | 28 | 51.16 | 261.5 | **.000*** |
| | Not knowledgeable | 46 | 29.18 | | |
| Application of Multimodal Analgesia in the Clinic | Multimodal analgesia is applying | 27 | 46.35 | 395.5 | .007 |
| | Multimodal analgesia is not applying | 47 | 32.41 | | |
| Status of Pain Assessment and Follow-up in the Clinic | Pain assessment and follow-up are applying correctly and effectively | 46 | 38.78 | 585.0 | .510 |
| | Inadequacies in pain assessment and follow-up | 128 | 35.39 | | |
| State of Knowledge on Analgesics | Knowledgeable | 25 | 43.08 | 473.0 | .110 |
| | Not knowledgeable | 49 | 34.65 | | |

U: Mann Whitney U, *p<0.05

**Table 5. Comparison of neurosurgery nurses' knowledge levels with "educational status - working years" (N=74)**

| Variables | | Knowledge Levels of Multimodal Analgesia | | | |
|---|---|---|---|---|---|
| | | N | Mean Rank | $\chi^2$ | P |
| Educational Status | Vocational High School of Health | 6 | 25.08 | 12.1 | **.002*** |
| | Bachelor's degree | 54 | 34.42 | | |
| | Postgraduate | 14 | 54.71 | | |

| | | | | | |
|---|---|---|---|---|---|
| Working Years | 0-1 year | 17 | 33.03 | 1.1 | .572 |
| | 1-5 years | 20 | 40.38 | | |
| | 5 years or more | 37 | 38.00 | | |

$\chi^2$: Kruskal Wallis

## Discussion

Pain is an important factor in the recovery process after surgery since untreated pain causes delayed mobilization, prolonged hospital stay, disability, and reduced quality of life (Ahmad et al., 2021; Yoo et al., 2019). In the meantime, high postoperative pain levels are associated with an increased risk of chronic pain. The use of opioids for postoperative pain management in neurosurgery patients may mask changes in neurological status. Therefore, it is recommended to use multimodal analgesia methods in the pain management of neurosurgery patients (Ahmad et al., 2021; Haussalo, 2021; Titsworth et al., 2016; Yoo et al., 2019). Nurses have an important role in multimodal analgesia, as they play an active role in the evaluation of pain, in the implementation of treatment, in the follow-up of patients, in monitoring the effectiveness of the practice and in providing education (Erciyas et al., 2019). Similar to the literature (Adem et al., 2017; Colpan 2021; Erciyas et al., 2019), it was found in this study that the majority of nurses had not heard of the concept of multimodal analgesia before and they did not have knowledge about multimodal analgesia. It is predicted that this situation came out of the inability to follow current developments adequately and the inability to reflect the results of the studies on this subject to the clinic, and therefore the awareness of the nurses on this issue cannot be raised.

Multimodal analgesia is a method that provides quality analgesia, reduces opioid-related side effects, and provides adequate analgesia with synergistic effects between different analgesics. Multiple nociceptive pathways to the central nervous system aim to use multiple pharmacologically different mechanisms to modulate stimulus (Yilmazlar, 2013). For this reason, it is thought that it would be beneficial for nurses to have knowledge about multimodal treatment options, analgesics used in pain management and their side effects. In the form which is the nurses' knowledge about multimodal analgesia was evaluated; it was seen that the least correct response of the nurses was the statement. *As the effect level of the drugs increases in the multimodal analgesia method, there may be an increase in the side effects that can be seen in the patient.* Similarly, it has been reported in studies that nurses have a lack of knowledge about pain (Adem et al., 2017; Kiekkas et al., 2015; Menlah et al., 2018). It is thought that this result may be related to the fact that nurses do not have enough knowledge about the pharmacological properties and mechanisms of drugs action.

Nurses have important responsibilities in multimodal analgesia practices (Karadakovan & Eti Aslan, 2010; Manworren, 2015; Senyuz & Kocasli 2017). Erciyas et al. (2019) found that the knowledge level of nurses about multimodal analgesia was moderate, Menlah et al. (2018) found that less than half of the nurses answered the question about multimodal analgesia correctly, Kiekkas et al. (2015) found that nurses working in surgical units have a low level of knowledge and attitudes towards pain. Although most of the nurses in the study did not have knowledge about multimodal analgesia and stated that multimodal analgesia was not applied in the clinic they worked in; more than half of them stated that the analgesia treatment applied in the clinic is *combination of opioid, non-steroidal anti-inflammatory and paracetamol group drugs*. Considering the fact that the total knowledge level of the nurses is not low, it is thought that the main problem is that the nurses do not have enough knowledge of the terminology of "multimodal analgesia" and that they do not have awareness about multimodal analgesia.

**Conclusions:** As a result of the study, it was determined that although the majority of the nurses thought that they did not have

sufficient knowledge about multimodal analgesia and stated that they did not use multimodal analgesia methods in their clinics, their knowledge score averages were higher than expected. In line with these results, it can be recommended to plan trainings prepared in line with evidence-based guidelines and to give these trainings at regular intervals in order to increase the awareness of nurses about multimodal analgesia methods and to inform nurses who have just started working on multimodal analgesia methods.

**Limitations of the study:** The limitation of this study is the inability to reach the whole population, the validity of the data collection form is evaluated only by pilot study and the expert opinions are not consulted, the study is done in a single center and only one region in Turkey, the sample size is low/ insufficient. Future studies should be planned and implemented with larger sample groups by considering these limitations. In addition, it may be possible to observe the differences between countries by comparing the data obtained from multicenter countries.

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