
**“PREOPERATIVE PREDICTORS OF SEVERE
POSTOPERATIVE PAIN IN ORTHOPAEDIC
SURGERIES – A HOSPITAL BASED
OBSERVATIONAL PROSPECTIVE STUDY”**

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ABSTRACT

Introduction: This study aimed to discover preoperative risk factors for significant postoperative pain because postoperative discomfort is a prevalent cause of delayed mobilization and patient dissatisfaction in orthopedic surgeries.

Patients and Methods: 197 orthopedic surgery patients who gave their consent over the course of a year were admitted, operated on, and had their postoperative discomfort evaluated. Preoperative predictors of severe postoperative pain were evaluated using a standardized questionnaire with 20 characteristics that included medical history, surgical specifics, and demographics and patients were asked to mark their postoperative pain using VAS (Visual Analog Scale) Score.

Results: Out of the 197 analyzed patients, 107 experienced significant postoperative pain. Higher preoperative pain and cases requiring emergency orthopaedic surgery (traumatic fracture cases) were highly statistically significant ($p < 0.001$). Other predictors with a p -value < 0.05 included diabetes, depression, anxiety, smoking, age < 50 years, female gender, overweight, general anesthesia, surgery duration > 100 min, and incision length > 12 cm. Predictors with $p > 0.05$ were deemed not significant and encompassed education status, occupation type, alcohol consumption, history of previous surgery, fracture site, preoperative analgesics, American Society of Anesthesiologists (ASA) status, and type of surgery.

Conclusion: The study has demonstrated that the occurrence of severe postoperative pain early after various types of surgery can be predicted with a scoring rule, using a small set of predictors that can be easily obtained preoperatively.

Keywords: VAS Score, Post-Operative Pain, Predictors

LIST OF ABBREVIATIONS

PACU	Post Anaesthesia Care Unit
ASA	American Society of Anaesthesiologist
ASAPS	American Society of Anaesthesiologist Physical Status
GA	General Anaesthesia
NSAID	Nonsteroidal Anti-Inflammatory Drugs
CABG	Coronary Artery Bypass Graft
IV	Intravenous
BP	Blood Pressure
USG	Ultrasonography/Ultrasound
PCA	Patient controlled analgesia
VAS	Visual Analog Scale
VRS	Verbal Rating Scale
NRS	Numerical Rating Scale
TENS	Transcutaneous Electrical Nerve Stimulation
mm	millimetre
cm	centimetre
GI	Gastrointestinal
KA	Knee Arthroplasty
TKA	Total Knee Arthroplasty
THA	Total Hip Arthroplasty
CPSP	Chronic Post Surgical Pain
TAPP	Transabdominal pre-peritoneal
TEP	Totally Extraperitoneal

PSQ	Pain Sensitivity Questionnaire
ODI	Oswestry Disability Index
HADS	Hospital Anxiety and Depression Scale
ICU	Intensive Care Unit
LPPSq	Leiden Perioperative Care Patient Satisfaction Questionnaire
BMI	Body Mass Index
POP	Post Operative Pain
ISB	Interscalene Block
AUC	Area Under Curve
GNRI	Geriatric Nutritional Risk Index
APOP	Acute Post Operative Pain
PROMIS	Patient Reported Outcomes Measurement Information System
PI	Pain Interference
ACLR	Anterior Cruciate Ligament Reconstruction
B- MEPS	Brief Measure of Emotional Preoperative Stress
OA	Osteoarthritis
TSP	Temporal Summation of Pain
BPI	Brief Pain Inventory
SF-MPQ	Short Form McGill Pain Questionnaire
PP	Preoperative Pain
APP	Anticipated Postoperative Pain
3DPP	3 Days Post Operative Pain
6WPP	6 Weeks Post Operative Pain
POD	Post Operative Day

LAR	Legally Authorised Representative
CT	Computed Tomography
SPSS	Statistical Package for Social Sciences
HAM-A	Hamilton Anxiety Rating Scale
HAM- D	Hamilton Depression Rating Scale
MIPO	Minimally Invasive Plate Osteosynthesis
CRIF	Closed Reduction and Internal Fixation
ORIF	Open Reduction and Internal Fixation
TRPA-1	Transient Receptor Potential Channel , Subfamily A, Member 1

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INTRODUCTION

Orthopaedic surgeries, encompassing a wide array of procedures ranging from joint replacements to fracture fixations, are commonly associated with postoperative pain. Despite significant advancements in surgical techniques and pain management strategies, still a significant proportion of patients must endure severe post-operative pain. This persistent issue results in extended recovery periods, diminished patient satisfaction, and potentially compromised clinical outcomes. Addressing this challenge remains crucial to improving the overall effectiveness of surgical interventions and enhancing patient care. Identifying pre-operative predictors of severe postoperative pain is crucial for optimizing pain management strategies, enhancing patient care, and improving surgical outcomes.

Pain is a complex and deeply individualized phenomenon, as articulated by McCaffery's famous quote: "pain is whatever the experiencing person says it is and exists whenever he/she says it does". This experience inflicts considerable distress upon patients and can adversely impact both endocrine and immune functions. Consequently, it can impede processes such as wound healing and contribute to the development of cardiopulmonary and thromboembolic disorders.

Since 1999, pain has been recognized as the "fifth vital sign"⁽¹⁾, following the implementation of guidelines by the "Joint Commission on Accreditation of Healthcare Organizations" to ensure its proper evaluation and treatment.⁽¹⁾ With the aging and expanding population, the global demand for surgical procedures has significantly increased. As a result, the number of surgeries performed annually worldwide has surpassed 280 million. This trend underscores the growing need for advanced medical resources and improved healthcare infrastructure to accommodate

the rising volume of surgical interventions.⁽²⁻⁸⁾ Many research findings indicate that the management of acute pain following an orthopaedic procedure is often inadequate and not sufficiently addressed.⁽⁹⁻¹²⁾

Notably, ineffectual control of postoperative pain is linked to adverse outcomes such as prolonged hospital stays, disrupted sleep, delayed mobilization, and increased reliance on opioids.^(13,14) Additionally, inadequate management of postoperative pain has been associated with delirium in older adults, the development of chronic pain conditions, as well as various cardiopulmonary and thromboembolic complications.⁽¹⁵⁻¹⁷⁾ Enhancing postoperative pain management may involve identifying preoperative indicators of inadequate pain control to facilitate the implementation of anticipatory and personalized interventions.^(18,19)

Understanding the predictors of severe postoperative pain can aid orthopaedic surgeons and pain management specialists in developing personalized pain management plans tailored to individual patient profiles. Moreover, identifying high-risk patients pre-operatively allows for early interventions, such as optimizing analgesic regimens, implementing psychological support strategies, and refining surgical techniques, with the goal of reducing post-operative pain levels and improving patient outcomes.

Previous research has delineated a limited subset of factors that contribute to inadequate management of postoperative pain. Among these factors are age, levels of anxiety, preexisting pain conditions, and the complexity or type of surgical intervention undergone.⁽²⁰⁾ Nevertheless, quantitative analysis faced obstacles due to inconsistencies in reported associations and variations in study designs among the included research. Given the passage of nearly a decade since its publication,

numerous new studies with enhanced methodological rigor have emerged, presenting an opportunity for an updated literature summary and pooled risk estimation.^(21–24)

The persistent challenge of providing effective post-surgical pain relief persists within healthcare settings. A national survey conducted in the United States, involving 300-post-operative patients over a period of five years, unveiled that 86% patients had endured pain, with 75% of them rating their pain as moderate to severe in their immediate post-operative period. “Additionally, research suggests that 41% of post-operative patients had reported moderate to severe pain during their stay in the Post Anaesthesia Care Unit (PACU)”⁽²⁵⁾. Insufficiently managed post-operative pain is linked with a myriad of adverse outcomes, including impaired physical capabilities, heightened morbidity, compromised Quality of Life, and escalated healthcare expenditures. Additionally, insufficient alleviation of postoperative pain correlates with the persistence of pain following surgery and prolonged recovery and discharge from the Post Anaesthesia Care Unit (PACU).

The aim of this research study is to discover pre-operative factors that could forecast the emergence of severe postoperative pain in orthopaedic surgeries. Through a thorough investigation encompassing diverse patient-related variables such as demographic attributes, medical background, pre-operative pain severity, psychological elements, and surgical aspects, this study endeavours to elucidate potential risk factors linked to increased postoperative pain intensity.

By conducting a comprehensive examination of pre-operative predictors associated with severe postoperative pain in orthopaedic surgeries, this research aims to provide valuable contributions to the current understanding of perioperative and postoperative pain management. Ultimately, these insights are anticipated to drive advancements in patient care and surgical practice.

AIMS AND OBJECTIVES

The study aims to identify significant preoperative predictors of severe postoperative pain in major orthopaedic surgeries by analysing demographic, medical, psychological, surgical, and other factors.

NEED FOR THE STUDY

This prospective observational study aims to investigate preoperative factors that could predict the development of severe postoperative pain in orthopaedic surgeries. Understanding these predictors is crucial for optimizing pain-management stratagems and enhancing patient results. Severe postoperative pain can significantly influence patients' recovery, functional outcomes, and general satisfaction with the surgical experience. By identifying specific preoperative variables associated with heightened pain intensity following orthopaedic procedures, we can potentially tailor preoperative interventions and perioperative analgesic regimens to mitigate the risk of severe postoperative pain. This study seeks to fill a gap in current knowledge by prospectively assessing various preoperative factors such as demographic characteristics, comorbidities, psychological factors, preoperative pain levels, and surgical factors to determine their predictive value for severe postoperative pain. The results of the study may help in assisting clinicians to identifying patients who are at elevated risk, thereby enabling the implementation of tailored pain management approaches. Consequently, this could lead to improvements in patient care and better surgical outcomes in the field of orthopaedic surgery.

REVIEW OF LITERATURE

Achieving improved postoperative pain management necessitates a thorough comprehension of potential predictors associated with inadequately controlled acute pain. Extensive exploration has been conducted into various pre-operative and intra-operative factors influencing pain intensity. For example, “studies have demonstrated that, females, younger-age, lower American Society of Anaesthesiologists Physical Status (ASAPS), and the administration of general anaesthesia are associated with an increased likelihood of experiencing severe/extreme pain in PACU (Post Anaesthesia Care Unit).”⁽²⁵⁾

Furthermore, additional research has pinpointed preoperative analgesic medication usage, elevated intraoperative opioid dosages, and the application of general anaesthesia as notable indicators of severe post-operative pain throughout PACU (Post Anaesthesia Care Unit) recovery period. A research study done in Singapore, “involving 590 post-operative patients, further emphasized that young patients, operative durations greater than 2 hours, same-day admissions, and the utilization of GA (General Anaesthesia) were associated with patients experiencing moderate to severe post-operative pain in the PACU (Post-Anaesthesia-Care-Unit).”⁽²⁶⁾

Additionally, recent studies have identified several factors as notable indicators of severe post-surgical/operative pain in PACU recovery phase. These include preoperative analgesic medication usage, higher intraoperative opioid dosages, and the administration of general anaesthesia. These findings underscore the importance of recognizing and addressing these factors to optimize postoperative pain management strategies and enhance patient outcomes in the perioperative period.

Prior researches examining the Predictive Factors for post-operative pain of severe/extreme intensity in the immediate post-surgical/operative period has generated conflicting results. Consequently, there is a need for more extensive evidence to clarify the connection between Pre-Operative and Intra-Operative variables and inadequately or insufficiently managed pain during the critical period in patients undergoing orthopaedic surgeries. The identification of predictive factors linked to severe/extreme Post-Operative Pain can facilitate identification of high-risk patients and the customization of their pain management approaches accordingly.

The main aim of managing post-operative pain is to alleviate the adverse effects of acute Post-Surgical/Post-Operative pain and support the patients in returning to their regular daily activities seamlessly. Historically, opioid analgesics have been the primary modality of treatment for acute post-operative pain. Nonetheless, increasing rates of mortality and morbidity associated with misuse of opioid have prompted growing demands for broader examination of pain management approaches that endorse a multimodal strategy.⁽²⁷⁾ These initiatives face significant challenges, intensified by the Subjective Nature of Pain Perception, making it difficult to ensure effective pain management. Additionally, some of the patients' Comorbidities and Social Factors can increase susceptibility to Pain.⁽²⁸⁾

Approximately 75% of patients undergoing surgery suffers from acute post-operative pain, frequently varying in intensity from moderate to high.⁽²⁹⁾ Concerningly, fewer than half of these patients indicate adequate relief from postoperative pain. This statistic highlights a notable concern, as insufficient post-operative pain management can result in adverse physiological consequences in the immediate post-operative phase, potentially heightening likelihood of developing chronic pain related to the procedure.⁽³⁰⁾

Many adults experience severe and long-lasting pain after surgery, affecting a significant number, between 2% to 10%. One big challenge in managing this pain well is the lack of set rules for keeping track of pain levels or knowing when to change treatments to help reduce pain better. Having clear guidelines could make it easier for doctors to adjust treatments and improve how well pain is controlled after surgery.⁽³¹⁾

Anatomy and Physiology

The pathways of sensory nerves carrying pain signals are vital in transmitting sensations of pain.⁽³²⁾ Acute postsurgical pain can be classified into three primary types: inflammatory, nociceptive, and neuropathic. Inflammatory Pain arises when the nociceptive fibres become sensitized because of releasing of the Inflammatory substances, like Cytokines. Clinically, inflammatory pain may present with the typical Signs of Inflammation such as: heat or/and, redness, or/and pain, or/and swelling. This type of pain generally lasts from hours to days and is typically reversible. Nociceptive pain primarily involves “the activation of unmyelinated C-fibres, thinly myelinated A-delta fibres, and myelinated A-beta fibres. This type of pain typically arises from harmful stimuli, such as tissue damage during surgery (e.g., making an incision in the skin).”⁽³³⁾

Conversely, neuropathic pain is a consequence of damage to neuronal structures, particularly peripheral nerves, resulting in an increased sensitivity of axons to various stimuli. Unlike nociceptive or inflammatory pain, which arise from tissue damage or inflammation, neuropathic pain can manifest shortly after surgery and persist as chronic postoperative discomfort. This chronicity underscores the complex nature of neuropathic pain, wherein the nervous system undergoes alterations leading to prolonged pain experiences even after the initial injury has healed.

Post-operative pain can also be classified into visceral or the somatic types. Somatic pain is marked by substantial input from nociceptive myelinated A-beta fibres, which conduct signals rapidly and are found in both superficial and deep tissues. This type of pain usually manifests as a sharper, more localized sensation.

Conversely, visceral pain is associated with an intricate system of unmyelinated C-fibres and lightly myelinated A-delta fibres that span multiple internal organs and merge before entering the spinal cord. Moreover, visceral sensory fibres travel close to autonomic ganglia prior to reaching the spinal cord's dorsal root. These unique features of visceral pain fibres lead to a vague and hard-to-localize pain sensation, often accompanied by autonomic reactions such as variations in heart rate or blood pressure.

Approaches to pain management target the sensory pain pathway using various methods. These could involve blocking pain receptor function or suppressing the generation of pro-inflammatory substances.⁽³⁴⁾

Indications for Post-operative Pain control

Tailoring postoperative pain management to accommodate individual patient comorbidities and social considerations has demonstrated several beneficial outcomes. These encompass notable reductions in postoperative opioid consumption, abbreviated lengths of hospitalization, alleviated preoperative anxiety levels, and decreased requests for sedative medications. Such customized approaches not only optimize pain relief but also contribute to enhanced recovery experiences and improved overall patient satisfaction following surgical interventions.

Contra-Indications for Post-operative Pain control

Pharmacological agents utilized for managing postoperative pain should be abstained from in patients with a documented history of allergic reactions to their usage. Furthermore, Nonsteroidal-Anti-Inflammatory Drugs (NSAIDs) are not recommended for individuals who have undergone CABG (Coronary Artery Bypass Grafting) as they are more prone for adverse cardiovascular events.

Equipment

Equipments usually utilized in interventional practices for postoperative pain relief typically includes:

1. Peripheral intravenous (IV) access
2. Materials for sterile skin preparation
3. Setup for a sterile field
4. Monitoring equipment for vital signs, including telemetry, pulse oximetry, and non-invasive BP monitoring (Blood Pressure monitoring).
5. Resuscitation Equipments, e.g., Airway Supplies, Oxygen Supply, Suction, Resuscitative Medications, & Defibrillator
6. Ultrasound (USG) machine for guidance during certain procedures
7. Anaesthetic medications required for pain management
8. Various types of hollow needles, available in different gauges, shapes, and lengths, depending on type of anaesthesia administered (e.g., bevelled needles, or spinal needles, etc.)
9. Catheter assembly for continuous medication delivery if necessary
10. Peripheral nerve stimulator for nerve block procedures.

Equipments needed to establish PCA(Patient-Controlled-Analgesia) pumps includes:

1. Peripheral Intravenous (IV) access for medication delivery.
2. Patient-controlled analgesia pump device, enabling patients to self-administer predetermined doses of medication.
3. IV tubing primed with saline, connecting the pump to the patient's IV access.
4. Carbon dioxide detector cannula, for monitoring end-tidal carbon dioxide levels in patients receiving opioid medications.
5. Narcotic medication, typically opioids like morphine or hydromorphone, programmed into the PCA pump for patient administration.

Common tools used to assess the adequacy of control of pain in acute management of pain comprise:

1. Visual Analog Scale (VAS): A continuous measurement tool where patients mark their level of pain on a line, usually spanning from "no pain" to "the worst pain imaginable."
2. Heft-Parker Visual Analog Scale: Like VAS, this scale asks patients to mark their pain intensity on a line, often with descriptors at each end.
3. Verbal Rating Scale (VRS): Patients articulate their pain levels by selecting from predefined descriptors like "no pain," "mild pain," "moderate pain," and "severe pain."
4. Numerical Rating Scale (NRS): Patients assess their pain intensity on a numerical scale, usually from number 0 all the way up to 10, where 0 will signify "no pain" and 10 will signify "the worst pain imaginable."
5. The Faces Pain Scale: particularly beneficial for children or those facing communication challenges, features a sequence of facial expressions

spanning from happy (indicating absence of pain) to distressed (signifying severe pain). Patients select the face that most closely mirrors their level of pain intensity.

6. The Wong Baker Faces Pain Rating Scale, akin to the Faces-Pain-Scale, employs a range of facial expressions representing different degrees of pain levels, allowing the patients to specify their intensity of discomfort.

Technique for Post-operative Pain control

A wide array of interventions and management strategies, spanning preoperative, intraoperative, and postoperative stages, are accessible and perpetually advancing to mitigate and address postoperative pain.⁽³⁵⁾ In 2012, the ASA (American Society of Anaesthesiologists) published a set of guidelines for addressing acute pain in the Peri-Operative Phase, a document that underwent assessment and approval by the “American Society of Regional Anaesthesia and Pain Medicine”.^(36,37)

The following are examples of multimodal treatments for postsurgical pain:

1. Systemic-pharmacological-therapy involves a range of medications, including Acetaminophen, Opioids, NSAIDs (Nonsteroidal Anti-Inflammatory Drugs) and other analgesics, which can be administered orally or intravenously to address postoperative pain. Treatment plans often combine, gabapentin, acetaminophen, steroids, NSAIDs (Nonsteroidal Anti-Inflammatory Drugs) or pregabalin, or opioids, intravenous (IV) ketamine, and IV lidocaine. The use of intramuscular injections for medication delivery is discouraged, with a preference for oral opioid administration over intravenous routes whenever feasible.

When parenteral medication is required, such as in situations with a risk of aspiration or bowel obstruction, intravenous patient-controlled analgesia (PCA) might be an option. It is recommended to avoid using a basal infusion of opioid medication in patients new to opioids using PCA for pain relief. Combining either acetaminophen or NSAIDs or both with opioids has shown to reduce opioid consumption and improve pain relief efficiently compared to only using opioids. Pregabalin or Gabapentin is recommended for preoperative use, particularly in Opioid-Tolerant patients, to help reduce opioid requirements. Ketamine is administered primarily for major surgeries in patients who are either highly resistant or sensitive to opioids, owing to its considerable side effects. Intraoperative IV lidocaine infusions have been linked to shortened ileus duration and improved pain management compared to a placebo.⁽³⁸⁾

2. Local, or intra-articular, or topical methods involve administering analgesic agents directly to the specific site of surgical intervention or discomfort. This encompasses the injection of local anaesthetics into surgical incisions or the application of topical creams onto the skin surface. Various approaches are employed to achieve localized pain management, which includes giving Peripheral-Nerve-Blocks or, Intra-Articular injections of anaesthetics, or infiltration of anaesthetics into surgical wounds, and the utilization of topical anaesthetics.

The adoption of these techniques should be guided by evidence demonstrating their effectiveness, despite potential variances in their widespread acceptance. While peripheral nerve blocks, intra-articular injections, and other localized methods may not be universally implemented,

their incorporation into clinical practice should be based on robust research outcomes and their potential to provide targeted pain relief.

3. Regional anaesthetic techniques entail administering local anaesthetics to obstruct particular nerves or nerve plexuses, delivering precise pain relief to a designated region of the body.

For fascial plane blocks, targeted regional anaesthetic injections, or occasionally epidural injections, a local anaesthetic may be employed either alone or in combination with intravenous (IV) opioid medication, depending on the surgical procedure's requirements. Typically, these procedures are performed by an anaesthesiologist using ultrasound guidance. Continuous intravenous medication delivered via an infusion pump is the favoured approach for addressing persistent postoperative pain compared to single-injection methods. Conversely, intrapleural analgesia is discouraged for pain management due to a lack of substantial evidence supporting its effectiveness, as well as the heightened risk of drug toxicity caused by significant systemic absorption within the pleural cavity.⁽³⁹⁻⁴¹⁾

4. Neuraxial anaesthetic techniques involve the use of spinal or epidural anaesthesia, where local anaesthetic medications are injected into the spinal or epidural space to block pain sensation in specific areas of the body. Usually, this involves giving an epidural injection combined with a local anaesthetic, or, often enhanced with intravenous (IV) opioid medication, and sometimes a spinal injection of opioid drugs. Epidural pain relief can be administered via a continuous drip or by allowing the patient to control the dosage themselves. These methods are commonly employed in major lower limb or hip surgeries as well as non-orthopaedic procedures such as in Abdominal Surgeries, C-Sections (Caesarean Sections). They offer substantial advantages for patients

who are at risk of heart or lung issues or those susceptible to extended intestinal obstruction.

5. Non-medication strategies for pain management includes various approaches like psychiatric or psychological therapies such as cognitive methods like relaxation techniques and mindfulness-centred therapies, as well as physiotherapy such as TENS- (Transcutaneous Electrical Nerve Stimulation). These approaches seek to relieve pain without relying on pharmaceuticals.

The utilization of multimodal strategies in pain management endeavours to enhance pain relief while mitigating the risks and adverse effects linked with individual treatments. These approaches are frequently employed in conjunction to deliver holistic management of pain customized to meet specific requirements and preferences of individualised patient.

To evaluate the effectiveness of the management of pain, various pain scales or scores can be used to measure and grade severity of pain. In context of acute pain, especially postoperative pain, one-dimensional pain scales are commonly employed. While there are various types of pain scales, VAS (Visual-Analog-Scale) is most often preferred for to assess the severity of Post-Operative Pain. In this a scale featuring a line that extending from zero to hundred (mm) or ten (cm), with descriptors of pain located at each end. Patients indicate their pain intensity by pointing out on the line, where zero represents "no pain" and ten (cm) or hundred (mm) represents the "most severe pain imaginable".⁽⁴²⁾

Complications of Post-operative Pain control

Poorly managed acute pain can result in several adverse effects on patient well-being, such as:

- Impaired performance of daily activities
- Disrupted sleep patterns
- Reduced mood
- Diminished libido
- Increased risk of developing chronic pain in the future⁽⁴³⁾

The administration of opioid medications can lead to various side effects, including:

- Nausea and vomiting
- Itching
- Urinary retention
- Ileus
- Drowsiness and sedation
- More prone for addiction and substance abuse
- Respiratory depression
- Severe consequences from overdoses, including death or disability

Early signs of Opioid-Withdrawal include:

- Frequent yawning and muscle aches
- Sweating and insomnia
- Anxiety and restlessness
- Tearing and runny nose

Later symptoms of Opioid-Withdrawal include:

- Diarrhoea and abdominal cramps
- Goosebumps, nausea, and vomiting
- Rapid heartbeat and high blood pressure
- Dilated pupils and blurred vision

The use of gabapentin or pregabalin may cause:

- Dizziness
- Sedation

When formulating a pain management strategy, consider the following:

- Risk of bleeding associated with NSAID use, especially in patients prone to blood loss, such as:
 - Those undergoing surgery on highly vascular structures like tonsillectomy
 - Compared to other surgeries like cholecystectomy
- NSAIDs are also associated with increased risks of:
 - GI (Gastro-Intestinal) bleed
 - Renal dysfunction

Peripheral Regional Anaesthesia techniques may cause:

- Transient-Motor blockades, potentially increasing risk of fall
- Vigilant monitoring is crucial when administering neuraxial analgesia to prevent complications such as:
 - Hypotension

- Spinal Cord Compression (due to hematoma or infection) which can lead to motor weakness
- Respiratory Depression
- In shoulder surgeries, continuous administration of intra-articular bupivacaine may increase the risk of:
 - Chondrolysis

Clinical Significance

“Inadequate management of postoperative pain can lead to negative physiological effects in the immediate postoperative period and heighten the risk of developing chronic pain.”⁽⁴⁴⁾ Chronic or long-standing pain can exacerbate the health of the patient and his/her well-being. With a deep and thorough knowledge and understanding of the pathophysiology of pain, particularly postoperative pain, and using predictors of severe postoperative pain, pain-reducing strategies can be successfully implemented. Based on the invasiveness of the procedure, the patient's comorbidities, and their social factors, clinicians can formulate an optimal pain management strategy aimed at reducing the probability of adverse outcomes.⁽⁴⁵⁾ Moreover, effective Post-Operative Pain management has been demonstrated to alleviate patient distress, shorten hospitalization duration, facilitate earlier mobilization, and return to normal activities, and enhance patient satisfaction.⁽⁴⁶⁾

While opioid pain relievers continue to play a central role in managing pain after surgery, the increase in harm and deaths related to opioids among the general population underscores the importance of carefully evaluating a patient's risk of substance use disorder or medication misuse before recommending opioids.⁽⁴⁷⁾ Upon discharge, patients should be instructed on safe storage procedures and appropriate methods for medication disposal. Emphasizing a multimodal strategy and customizing

pain management plans to meet individual requirements can aid in diminishing reliance on opioids while guaranteeing adequate pain relief.

A study by Periañez et al⁽⁴⁸⁾ (2024) framed as an observational and prospective study, took place at a University Hospital in Minas Gerais, Brazil, focusing on demographic, clinical, and surgical factors. Data was gathered through a devised collection tool, utilizing a verbal numerical scale to gauge pre- and post-surgery pain levels in the PACU, and path analysis was employed to assess predictive modelling. Involving 226 patients, the study revealed a 31.9% incidence of PACU pain. Analysis of a model incorporating various variables highlighted age, gender, oncological diagnosis, surgery type, duration, and opioid dosage during surgery as predictors of PACU pain. The final model, adjusted for modification indices, demonstrated good data fit. These findings underscore the importance of PACU pain management and offer insights into anticipating acute postoperative pain and tailoring perioperative analgesia strategies.

In a 6-month prospective observational study by Terradas-Monllor et al⁽⁴⁹⁾ (2024) of 115 individuals undergoing knee arthroplasty (KA) for primary osteoarthritis, researchers explored the impact of psychological factors on chronic postsurgical pain (CPSP). Assessments of fear of movement, depression, pain catastrophizing, anxiety, and attitude towards pain were conducted one-week post-surgery. “Chronic post-surgical pain (CPSP) has been defined as pain with an intensity of ≥ 30 on a 100-mm visual analog scale at 3- and 6-months following surgery. Initial findings indicated that baseline pain intensity, pain catastrophizing, fear of movement, anxiety, depression, and negative pain attitudes were all significant predictors of CPSP at both 3 and 6 months in univariate analyses.” Although, in multivariate analyses, only pain intensity and pain catastrophizing were predictive of

CPSP at 3 months, while at 6 months, pain intensity and scepticisms towards medical procedures emerged as the independent predictors. The study underscored that many psychological factors could be integrated into a broader category of pain-related psychological distress. This study highlights the significant role of cognitive and emotional factors, alongside pain intensity, in the development of CPSP following knee arthroplasty. It suggests that addressing postoperative psychological distress in rehabilitation programs may mitigate the risk of developing CPSP, indicating a shift towards a more holistic approach in postoperative care.

Patients in a prospective, randomized clinical trial by Kubiliute et al⁽⁵⁰⁾ (2023) were randomized to either the TAPP or TEP groups. Three hours following surgery, postoperative pain was measured using a visual analogue scale (VAS), and preoperative and perioperative data were gathered. For comparison, patients were divided into groups based on their level of pain: moderate (VAS 0-2) and average or severe (VAS 3-10) carried out a prospective, randomized clinical study in which participants were randomized to be in the TEP or TAPP groups. Pre-operative and peri-operative data were gathered, and three hours after surgery, visual analogue scale (VAS) scale was used to measure and assess patients' postoperative pain, which divided them into groups for comparison: moderate pain (VAS 0-2) and average or severe pain (VAS 3-10). Smoking, having TAPP surgery, and having a longer disease duration were among the 132 male participants that were linked to an increased likelihood of moderate to severe postoperative discomfort. Conversely, shorter symptom duration and engaging in physical occupations were linked to a decreased risk of acute pain. The study suggests that the duration since hernia onset, smoking, engagement in a physically demanding occupation, and the use of the TAPP technique may serve as predictive factors for acute postoperative pain following

minimally invasive inguinal hernia repair. It recommends considering avoidance strategies or additional analgesia for patients exhibiting these predictors.

A study by Angadi et al⁽⁵¹⁾ (2023) was designed as a prospective observational study, involving sixty patients undergoing single-level lumbar fusion surgery. The main findings focused on the number of analgesics taken and the severity of postoperative pain. Pain sensitivity questionnaires (PSQ) and assessments of heat and pressure pain thresholds were used to assess preoperative pain sensitivity. “The Oswestry Disability Index (ODI) was used to measure functional status, and the Hospital Anxiety and Depression Scale (HADS) was used for psychosocial assessments.”⁽⁵¹⁾ Scores on the Preoperative Visual Analog Scale (VAS) were noted while participating in different tasks. From day 0 to day 3, analgesic needs and postoperative VAS ratings were tracked. Results indicated that higher HADS, PSQ, ODI scores, and female gender correlated with lower pain thresholds. Patients with lower preoperative VAS and higher neuro-touch scores had lower postoperative pain scores. Preoperative VAS, algometer, neuro-touch, and HADS scores were independent predictors of postoperative VAS at 6 hours. Factors such as preoperative VAS, algometer, and HADS scores were significantly correlated with postoperative breakthrough analgesic usage. The findings suggest that preoperative assessment of pain sensitivity can predict postoperative analgesic needs, guiding perioperative pain management strategies for better patient outcomes.

“In October 2022, two general hospitals in the Al-Qunfudhah governorate hosted patients from a variety of surgical specialties as part of a cross-sectional study” by Alnashri et al⁽⁵²⁾(2023). Postoperative patients were interviewed and their medical records were examined as part of the data collection process. Surgical patients who were 18 years of age or older met the inclusion criteria, but cases involving local

anesthetic, ICU admissions, participant refusal, and cognitive or communicative impairments were excluded. “The Leiden Perioperative Care Patient Satisfaction Questionnaire (LPPSq) was used to measure perioperative patient satisfaction. 83 of the 201 patients were included in the final analysis, which showed that 73.5% of patients were satisfied with their perioperative anaesthetic care overall.”⁽⁵²⁾ Patient satisfaction was statistically correlated with variables like smoking status, BMI, type of hospitalization, and hospital setting. Shaking, soreness after surgery, and nausea were the most often reported negative effects. The study suggests that smoking, BMI, type of admission, and hospital setting significantly influence patient satisfaction levels. Recommendations for future research include exploring additional satisfaction factors, such as operating room efficiency and discharge standards, and advocating for routine evaluations before patient discharge, particularly for those with altered consciousness. To increase patient satisfaction with perioperative anaesthetic care, ongoing evaluation and improvement initiatives are advised.

In a prospective study focused on adults from Northern Portugal, Gouveia et al⁽⁵³⁾ (2022) evaluated various factors to understand post-operative pain (POP) outcomes better. The study included 95 Caucasian participants, gathering data through clinical records and pre- and postoperative questionnaires. This data encompassed demographic and anthropometric details, surgical type, patient ASA classification, sociocultural level, and levels of POP. The findings highlighted that younger woman undergoing total knee arthroplasty (TKA) experienced higher POP levels. An ASA 3 physical status was linked to increased pain intensity in females. Moreover, individuals with pre-existing chronic pain, those who were not diagnosed with depression, and those dissatisfied with their current jobs reported elevated POP levels.

On the other hand, retirees who had less education expressed more minor pain. This study finds that a number of important factors, such as work satisfaction, the kind of surgery, body mass index, the existence of chronic pain, and the lack of depression, are important predictors of postoperative pain (POP) after hip or knee arthroplasty. These results offer important new information for better postoperative pain management.

A study by Okoli et al⁽⁵⁴⁾ (2022) examined 1,384 patients who had elective outpatient orthopaedic surgeries performed between January 2018 and June 2019, using information from a prescription drug monitoring program on restricted medication prescriptions. Finding predictors for more opioid prescriptions and extended opioid use after six months was the goal. The findings indicated that over 10% of patients continued opioid use past six months. Among those exposed to opioids, 60.4% obtained at least one additional opioid prescription post-surgery, and 29.2% continued to fill prescriptions after six months. In contrast, among opioid-naive patients, 26.4% filled a second prescription, and only 6.0% continued use beyond six months. Older age, benzodiazepine usage, smoking, psychiatric problems, and prior opioid use were significant predictors of receiving a second opioid prescription. The research emphasizes how crucial it is to identify the risk variables that lead to chronic opioid use after orthopaedic surgery in order to better inform patient counselling and pain management techniques.

In a study involving 134 patients undergoing arthroscopic shoulder repair, Zeeni et al⁽⁵⁵⁾ (2022) examined the correlations between patient characteristics, surgical factors, and anaesthesia choices with postoperative outcomes, such as pain intensity, analgesic requirements, and functional recovery up to one-month post-surgery. The study used multiple linear regression analysis and mixed-effect linear

models to find that postoperative pain levels, opioid use, and patient functionality were significantly influenced by gender, the type of shoulder surgery, preoperative pain levels, preoperative use of non-steroidal anti-inflammatory drugs (NSAIDs), and the use of an interscalene block (ISB). Notably, omitting the ISB was associated with increased pain and opioid use shortly after surgery. Additionally, surgeries for rotator cuff repair and stabilization were linked to more intense pain and reduced functionality in the days and weeks following the procedure, underscoring the impact of surgical type and preoperative management on recovery outcomes.

In a comprehensive study by Liu et al⁽⁵⁶⁾ (2021) of 1,227 elderly patients undergoing elective orthopaedic surgery, researchers developed a predictive model for chronic post-surgical pain (CPSP). By gathering demographic and clinical data and conducting a follow-up three months post-surgery via a telephone questionnaire, the study identified six independent predictors of chronic post-surgical pain (CPSP): marital status, preoperative pain at both surgical and non-surgical sites, the specific type of surgery performed, duration of postoperative hospitalization, and the presence of acute postoperative pain. These factors were utilized to construct a nomogram, a visual prediction tool, which exhibited high predictive accuracy with an area under the curve (AUC) of 0.815, signifying its reliability and practical utility in clinical settings. This tool is especially valuable for identifying elderly orthopaedic surgery patients at high risk of CPSP, enabling healthcare providers to implement targeted interventions for better pain management and patient outcomes.

A study by Zheng et al⁽⁵⁷⁾ (2021) recruited 734 patients aged 65 and older who were undergoing gastrointestinal surgeries, to investigate the impact of nutritional status on postoperative pain management. These patients were categorized based on their geriatric nutritional risk index (GNRI) into two groups to assess their post-

surgery pain outcomes and analgesic use. A significant portion, 72.62%, were identified as having high nutritional risk (GNRI < 92). The study found that these high-risk patients experienced more frequent instances of inadequate pain control at various postoperative intervals and required higher amounts of pain medication in the initial 6 hours after surgery compared to their lower-risk counterparts. Logistic regression pinpointed high nutritional risk and female gender as significant predictors of insufficient postoperative pain relief, with the effect of high nutritional risk being particularly marked in female and early elderly patients. The analysis also established a GNRI threshold of 88 as a predictive marker for inadequate postoperative analgesia. These findings underscore the importance of incorporating preoperative nutritional assessments, specifically through tools like GNRI with a revised cutoff point, into standard care protocols to improve pain management outcomes for elderly patients following gastrointestinal surgeries.

Two significant preoperative predictors of severe postoperative pain immediately following the procedure were identified in a prospective observational study by Khalil et al. ⁽²⁵⁾ (2021) involving 153 patients who underwent orthopaedic surgeries: smoking status and physical health status, assessed using the ‘American Society of Anaesthesiologists Status Classification System’. The findings indicate that smokers had over twice the likelihood of experiencing severe pain post-surgery compared to nonsmokers. Additionally, those classified with severe systemic disease had markedly lower odds (by a factor of 4.27) of suffering from severe pain compared to their healthier counterparts. These insights highlight the importance of incorporating preoperative evaluations of smoking status and overall physical health into the pain management planning for orthopaedic surgery patients, aiming to ensure more effective postoperative pain control. ⁽²⁵⁾

A study by García-López et al⁽⁵⁸⁾ (2021) was a prospective, multicentre, international cohort investigation into postoperative pain outcomes, analysing 968 patients using 11-point scales for pain assessment and considering various patient and treatment factors. The study employed “statistical analysis to identify significant predictors of moderate to severe acute postoperative pain (APOP). The analysis included odds ratios, univariate and multivariate logistic regression, and Cohen's d for effect size.” The variables that were found to be associated with preoperative pain, postoperative pain, and general anaesthesia were also included in the analysis. No factors were found to mitigate this risk. The findings underscore the importance of these predictors in understanding and managing APOP, specifically in knee replacement surgeries, suggesting a need for further research to refine pain management strategies for patients at higher risk.

A study conducted from August 2016 to March 2018 at an urban academic institution by Kator et al⁽⁵⁹⁾ (2020) examined the impact of different parameters on postoperative pain interference in patients following elective outpatient orthopaedic surgery. PROMIS computer adaptive testing was used for baseline assessments and follow-ups two weeks after surgery on 435 patients, with an average age of 41.1 years and 47% female. The tests covered “six domains: Pain Interference (PI), Physical Function, Social Satisfaction, Fatigue, Anxiety, and Depression, in addition to Improvement and Satisfaction assessments.”⁽⁵⁹⁾ The average PI score increased somewhat from 60.1 prior to surgery to 61.7 two weeks later, according to the results. At the two-week mark, “PI outcomes were found to be negatively correlated with lower extremity surgery, past surgery on the same joint, opioid usage prior to surgery, depression, lower income and education levels, and a higher ASA score.”⁽⁵⁹⁾ On the other hand, improved PI was associated with superior baseline and postoperative

scores across all domains examined. The study found that lower extremity surgery, worse preoperative pain, and higher preoperative pain interference scores were independent predictors of postoperative pain interference through multivariable analysis. These results highlight the complex interactions between physical, psychological, and demographic aspects in the management of pain during the early stages following surgery, emphasizing the need for customized pain management approaches that take these diverse influences into account.

The objective of Barnett et al⁽⁶⁰⁾ (2020), nonrandomized controlled trial was to measure postoperative opioid use and pain levels without the use of regional anaesthesia in 20 patients, ages 18 to 35, undergoing either anterior cruciate ligament reconstruction (ACLR) or bridge-enhanced ACL repair. The trial, conducted by a single surgeon, monitored opioid consumption through patient pain medication logs post-discharge and recorded pain scores using a visual analog scale during follow-up visits. Results indicated a wide range in total morphine-equivalent opioid consumption between both groups, with the ACLR group using between 30 to 309 mg (4-42 oxycodone pills) and the bridge-enhanced ACL repair group using 75 to 254 mg (10-34 oxycodone pills). While not statistically significant, the ACLR group's average daily opioid consumption was somewhat greater than that of the bridge-enhanced repair group. Over a two-year postoperative period, both groups' pain assessments stayed consistent. Notably, there was a significant overabundance of opioid prescriptions-46 tablets on average more than needed for each patient-which suggests that over 70% of drugs were not used. While age, the occurrence of a concurrent meniscal repair, and the length of surgery did not affect opioid use, factors like higher preoperative body mass index and higher degrees of preoperative pain were linked to increased postoperative opioid intake. The study concludes that opioid intake did not

significantly differ between the two surgical techniques and underscores the issue of opioid overprescription, suggesting the need for more individualized postoperative pain management strategies.

In a research study conducted by Wolmeister et al.⁽⁶¹⁾ (2020), adult patients in ASA 2 and 3 who underwent major procedures in a range of medical specialties between March 2017 and March 2018 were included in a prospective observational cohort analysis. Patients underwent experimental pain assessments and serum biomarker collection after being evaluated before to surgery using “the Brief Measure of Emotional Preoperative Stress (B-MEPS) and the Central Sensitivity Inventory.”⁽⁶¹⁾ Postoperative examinations for the first 48 hours included measuring pain during rest and activity, as well as measuring morphine intake. On the third postoperative day, Quality-of-Recovery was assessed. Of the 150 patients, 23 (15%) had high levels of emotional stress before to surgery. These symptoms were substantially correlated with both the Central Sensitization Inventory scores and prior mental diagnoses. Pain at rest was much lower than movement-evoked pain during the first 12 to 48 hours following surgery, and B-MEPS showed a sustained predictive value for movement-evoked pain. Furthermore, postoperative pain was independently predicted by variables such preoperative pressure pain tolerance, cancer surgery, and past pain. Within 48 hours after surgery, moderate to severe movement-evoked pain was found to be a sign of inadequate rehabilitation. The results imply that individuals at risk for severe postoperative pain could be identified by a straightforward preoperative emotional screening, which could allow for targeted interventions to improve perioperative outcomes down the road.

To find predictors of pain scores and suffering in teenagers undergoing laparoscopic surgical procedures Visoiu et al.⁽⁶²⁾ (2019) collected data from medical

records and conducted two medical interviews: one at enrolment and another on the first postoperative day after the surgery. 202 individuals, mostly female (56.4%) with a mean age of 13.8 years, were included in the study. Significant predictors of the teenagers' pain response were found through analysis. These included the utilization of regional anaesthesia procedures such transversus abdominis plane, single-injection rectus sheath, and paravertebral nerve blocks, as well as experiencing discomfort on the day of operation. Furthermore, all patients, but especially females and teenagers between the ages of 14 and 17, reported better mood responses and less catastrophic thoughts when regional anaesthetic was used. The findings suggest that incorporating truncal blocks into pain management strategies could enhance postoperative pain control for teenagers undergoing laparoscopic surgeries.

In a Guichard et al⁽⁶³⁾ (2019) study, preoperative and postoperative pain experiences after ankle surgery were examined by evaluating 49 patients over an 18-month period. The length, intensity, and kind of preoperative discomfort, psychological distress, the use of opioids, and the type of operation were among the parameters assessed. A pain trajectory model was used to examine acute postoperative pain during the first 10 days following surgery. 87% of patients had preoperative chronic pain, according to the results, and 34% had a high trajectory of postoperative pain, of which 44% expressed chronic pain at the 18-month follow-up. Patients with a high acute pain trajectory frequently had higher prevalence of pre-operative opioid use, a higher prevalence of pre-operative neuropathic pain, heightened ratings on the brief pain inventory, and increased psychological distress. In addition to experiencing more intense pain prior to surgery, individuals who developed chronic pain also scored higher on psychological distress and the brief pain evaluation. Notably, the kind of ankle surgery had no bearing on the degree of pain. The findings suggest that

patients who experience psychological distress and more severe Pre-Operative Pain are more probable to endure both acute and chronic pain following ankle surgery, independent of the specific surgical procedure used.

Abrecht et al⁽⁶⁴⁾ (2019) conducted a study involving 126 OA(Osteoarthritis) patients aged 45 years and above who underwent primary TKA(Total Knee Arthroplasty) at Brigham and Women's Hospital. The study utilized pre-operative pain questionnaires and quantitative sensory testing to establish psychophysical and psychosocial profiles. Opioid intake and post-operative pain ratings were the main outcomes. A number of characteristics, including female gender, BMI (Body Mass Index), history of previous knee surgeries, and TSP (Temporal Summation of Pain), were found to be predictive of acute postoperative pain scores by regression analysis. Among the variables that predicted the use of opioids were TSP, BMI, age, and tourniquet time. Notably, TSP and BMI emerged as significant and independent predictors for both pain intensity and opioid consumption. Although psychological elements such as somatization and catastrophizing were linked to surgical results, they typically could not account for a significant portion of variation on their own. The results imply that, by predicting the probability of unfavourable pain outcomes, BMI and quantitative sensory testing—specifically, TSP—may provide insightful preoperative assessments for patients undergoing total knee arthroplasty and related procedures.

In a prospective observational study by Pereira et al⁽⁶⁵⁾ (2019), Unilateral TKA (Total Knee Arthroplasty) or THA (Total Hip Arthroplasty) were performed in patients with osteoarthritis of knee or hip respectively and were evaluated for pain and health status at three different time points: preoperatively, twenty-four hours post-surgery, and six months following surgery. The BPI (Brief Pain Inventory) was used

to assess pain levels, while the SF-12V2 Health Survey evaluated overall health status. The study included 43 patients, with 25.6% men and 74.4% women, and 68 years as average age. During the surgeries, different types of anaesthesia were utilized: general anaesthesia (25.6%), neuraxial anaesthesia (55.8%), and a combination of both (18.6%). The findings revealed that neuraxial anaesthesia offered superior management of postoperative pain, leading to significant decreases in pain intensity levels categorized as "worst," "moderate," and "current" after six months. Patients who underwent combined anaesthesia reported reduced "moderate" pain levels at the six-month mark. Notably, only those in the neuraxial anaesthesia group experienced a decline in pain affecting their ability to walk. Factors predicting the development of pain at the six-month follow-up included undergoing total knee arthroplasty (TKA), experiencing severe preoperative pain, and receiving general anaesthesia. The results indicate that individuals suffering from osteoarthritis (OA) and experiencing substantial pain before surgery could gain advantages from customized care before and during the operation. This care should focus on managing pain before surgery and employing neuraxial anaesthesia.

A study by Desai et al⁽⁶⁶⁾ (2012) evaluated Pre-Operative and Post-Operative pain in 78 patients who were undergoing elbow and shoulder surgeries using a questionnaire called SF-MPQ (Short-Form McGill Pain Questionnaire). Patients evaluated their Pre-Operative Pain (PP) and Anticipated Post-Operative Pain (APP) before surgery, as well as their pain levels three days (3DPP) and six weeks (6WPP) after surgery. The study showed that both Preoperative Pain (APP) and Perioperative Pain (PP) were robust indicators of pain following surgery, with APP typically exceeding the observed levels of pain post-surgery. Interestingly, pain levels reported six weeks after the operation were notably lower compared to those noted three days

after surgery. Variables like gender, duration of condition, and surgical procedure type did not exhibit notable associations, whereas the age bracket of 18 to 39 demonstrated a significant correlation with post-surgery pain intensity. These results highlight the necessity of addressing both immediate and prolonged postoperative pain to minimize complications effectively. Despite overall pain levels being lower than anticipated or preoperative levels due to effective pain management strategies, surgeons should consider patients' PP and APP to optimize postoperative pain management and mitigate potential complications.

A systematic review conducted by Vivian et al (2009) (20) analysed 48 studies involving a total of 23,037 patients to identify independent predictors of post-operative pain and consumption of analgesic. The examination uncovered that pre-surgery pain, anxiety levels beforehand, patient age, and the nature of the surgical procedure were all key factors in predicting the levels of pain experienced after surgery. When it came to the use of pain relief medication, important factors included the type of surgery, patient age, and their psychological state. Surprisingly, gender did not consistently predict either post-surgery pain levels or analgesic usage, contrary to what might be expected. Recognizing these predictive factors in patients vulnerable to post-surgery pain can aid in developing personalized interventions and more effective pain management techniques. However, predictive models from the studies accounted for less than 54% of the variance, highlighting the need for more comprehensive research with robust statistical methodologies and validated study designs to better understand these predictors.

METHODOLOGY

This was a one-year hospital-based observational prospective study conducted at KLE's Dr. Prabhakar Kore Hospital & Medical Research Centre and Charitable Hospital in Belagavi. Patients who underwent major orthopaedic surgeries and remained hospitalized through Post Operative Day 2 were monitored for severe postoperative pain. Data were collected from patients who had undergone orthopaedic surgeries at the hospital between June 2022, and June 2023.

Study Design: A One-year hospital based Observational Prospective study.

Minimum Sample Size: 154

Sampling Technique: The minimum sample size formula based on prevalence rate is

$$n = \frac{z_{\alpha}^2 P(1-P)}{d^2}$$

where P is the prevalence rate of severe pain after surgery and is the percentage likely difference in the prevalence. z_{α} is linked with the level of significance. For 5% level of the significance $z_{\alpha} = 1.96$.

With P= 28.5%

and d = 25% of P = 7.125%,

the sample size is 154.

Study protocol: The study examined 197 patients who underwent major orthopaedic surgeries, ensuring adherence to specific inclusion and exclusion criteria. Patients were thoroughly briefed about the study objectives, and informed consent was obtained prior to participation.

Upon admission to the hospital, patients were individually interviewed and provided with a preoperative questionnaire. They were instructed to indicate their most intense pain level using a Visual Analogue Scale (VAS). Pre-Operatively and Post-operatively, patients were asked to record their most severe pain experienced on the day of surgery (POD0) using the VAS. Similar assessments were conducted for POD1 and POD2, with pain scores recorded accordingly. The mean of the highest two pain scores out of these three days was calculated to determine pain severity, categorizing scores exceeding 75 points as indicative of severe pain.

Upon completion of the study, a master chart was compiled using Excel, and statistical software was employed to analyze the data. Preoperative predictors of severe postoperative pain were identified through comprehensive analysis of questionnaire responses, with particular emphasis placed on predictors with the highest frequency of significant responses.

Data collection procedure: Data was be collected from patients undergoing orthopaedic surgeries in the form of a questionnaire with 20 points predictors after admission before the surgery is undertaken and followed up with assessing the pain on POD0, POD1 and POD2 in the form of a VAS scale for pain (0 to 100, where severe pain is indicated by more than/equal to 75)

Data processing and analysis/statistical analysis: Upon completion of the study, data was collated into a comprehensive Excel spreadsheet and a master chart was prepared, and statistical software was employed to analyse the data. The analysis focused on identifying preoperative factors associated with severe postoperative pain, prioritizing variables based on the frequency of significant responses. The collected data was organized into a structured table within Microsoft Excel and subjected to Chi Square analysis to assess the significance of each predictor variable. Each predictor's

significance was evaluated using Chi Square analysis, with p-values below 0.05 indicating statistical significance.

Inclusion Criteria:

1. Male and female patients.
2. Patients aged between 18-75 years old, both inclusive.
3. Able to provide consent for participation independently or through a Legally Authorized Representative (LAR).
4. All major Orthopedic Surgeries requiring Open Reduction, Closed Reduction Internal Fixation, Total Hip Replacement, Total Knee Replacement, Arthroscopic Surgeries

Exclusion Criteria:

1. Minor Orthopedic procedures such as Cast/Slab Application, Closed Reduction and K wire Fixation
2. Day Care Orthopedic Surgeries
3. Refusal of Consent
4. Patient having any known Immunodeficiency
5. Simultaneous head injury presenting a substantial abnormality detected on a head CT scan.
6. Patients with pathological fracture
7. Patient on ventilator or requires ventilator
8. All females who have positive urine pregnancy test

9. Patients having rheumatoid arthritis

10. Pre-existing psychiatric disorders involving hallucinations, delusions, or schizophrenia, or neurological disorders, such as, Parkinson's disease Alzheimer's disease, which may impede evaluation and follow-up.

11. Patients already enrolled in another clinical trial.

12. Patients deemed by the investigator to be unsuitable for inclusion in the study.

RESULTS

All observations were recorded and analysed statistically using Microsoft Excel and the Statistical Package for the Social Sciences (SPSS) software. A total of 197 patients who underwent major orthopaedic procedures were evaluated. Twenty parameters were assessed for the study, including age, gender, education status, occupation, fracture site, preoperative analgesic use, American Society of Anaesthesiologist (ASA) status, BMI (Body Mass Index), preoperative pain score, urgency of surgery, type of surgery, type of anaesthesia chosen for surgery, duration(time taken) of surgery, length of incision, smoking history, alcohol history, history of diabetes, history of previous surgery, anxiety, depression, all of which were thoroughly documented. Preoperative and Postoperative Pain Status were documented using VAS (Visual Analogue Score) Scale with score more than 75 were deemed to be severe and considerable. All the parameters were assessed for their significance using chi- square test.

In the sample of 197 patients, 107 participants experienced severe postoperative pain based on the analysis conducted following their surgeries. The chi-square test was used to determine whether predictors were significant when the p-value was less than 0.05. Notably, **preoperative pain** emerged as the most influential factor, with 75 out of 94 patients who experienced severe preoperative pain likewise suffered from severe postoperative pain. Another important preoperative component that was found to be important was the **urgency of the surgery**; of the 128 patients who underwent emergency procedures, 82 experienced severe postoperative discomfort. 63 out of 102 individuals in the **18–50 age range** reported having severe postoperative discomfort.

Gender disparities were observed, with 47 out of 73 females reporting severe postoperative pain, indicating a higher frequency of this condition among females compared to males. Increased postoperative pain was correlated with several lifestyle factors, including diabetes (49 out of 76), smoking (41 out of 63), and having a body mass index (BMI) over 25 (40 out of 55). Severe postoperative pain was also linked to mental health disorders such as anxiety (15 out of 22) and depression (14 out of 18), as assessed by “HAM-A (Hamilton Anxiety Rating Scale) ”⁽⁹⁾ and “HAM-D (Hamilton Depression Rating Scale)” scores ^(67,68), respectively.

Moreover, a significant correlation was identified between intense postoperative pain and various intra-operative and peri-operative factors, such as the type of anaesthesia administered, the surgery's duration, and the incision's length. Specifically, high rate of post-operative discomfort were observed in patients who received **general anaesthesia** (30 out of 44), had procedures **longer than 100 minutes** (41 out of 63), and had **incisions larger than 12 cm** (46 out of 72). (Table 1)

Table 1: Predictors of Severe Postoperative Pain

Predictor		Number of patients	Percentage	Number of patients with severe pain	p-value	Significance
Total Patients		197	100	107		
Age	18- 50 years	102	51.78	63	0.0296	S
	>= 50 years	95	48.22	44		
Gender	Male	124	62.94	60	0.0294	S
	Female	73	37.06	47		
Education Status	Illiterate	25	12.69	15	0.3745	NS
	Primary School	23	11.68	15		
	Secondary School	48	24.37	28		
	High School	42	21.31	23		
	College Graduate and Higher	59	29.95	26		
Occupation	Sedentary Work	127	64.47	68	0.7696	NS
	Heavy Work	70	35.53	39		
Smoker	Yes	63	31.98	41	0.0375	S
	No	134	68.02	66		
Alcoholic	Yes	34	20.86	14	0.0908	NS
	No	163	79.14	93		
History of Diabetes Mellitus	Yes	76	38.58	49	0.0232	S
	No	121	61.42	58		
BMI of the patient	Underweight (<18.5)	6	3.06	3	0.0365	S

	Normal (18.5-24.9)	136	69.03	65		
	Overweight (25-29.9)	51	25.88	36		
	Obese (>30)	4	2.03	3		
History of previous surgeries?	Yes	66	33.50	37	0.7269	NS
	No	131	66.50	70		
Anxiety	Yes	22	11.17	17	0.0218	S
	No	175	88.83	90		
Depression	Yes	18	9.14	14	0.0360	S
	No	179	90.86	93		
Fracture Site	Upper Limb	58	29.44	16	0.47965	NS
	Lower Limb	118	59.90	59		
	Clavicle	17	8.64	6		
	Pelvis	2	1.01	1		
	Other	2	1.01	1		
Pre-Operative Analgesic	NSAIDs	64	32.49	35	0.681	NS
	Opioid	15	7.61	8		
	Both	28	14.21	18		
	Other	90	45.69	46		
American Society of Anaesthesiologists (ASA)	I	109	55.33	54	0.214	NS
	II	74	37.57	43		
	III	14	7.10	10		
	IV or higher	-	-	-		
Preoperative Pain	Mild (5-44)	26	13.20	3	<0.00001	HS

Based of VAS Scale	Moderate (45-74)	77	39.09	29		
	Severe (74-100)	94	47.71	75		
Urgency of Surgery	Emergency	128	64.97	82	0.00018	HS
	Elective	69	35.03	25		
Type Of Surgery	MIPO	8	4.06	3	0.09165	NS
	ORIF	113	57.37	64		
	CRIF	40	20.30	26		
	Others	36	18.27	14		
Type Of Anaesthesia to be given during surgery	General Anaesthesia	44	22.34	30	0.0361	S
	Regional Anaesthesia	153	77.66	77		
Duration of Surgery	<= 100 mins	134	68.02	66	0.0375	S
	> 100 mins	63	39.98	41		
Length of Largest incision	< 12 cm	125	63.45	61	0.0406	S
	> 12 cm	72	36.55	46		

Note: S-significant, HS-Highly significant, NS- Nonsignificant

Table 2: Association of AGE with Mean VAS (*Visual Analogue Scale*) score

AGE (YEARS)	MEAN VAS		TOTAL	p VALUE	INFERENCE
	< 75	≥ 75			
18- 50	39	63	102	0.0296	S
≥ 50	51	44	95		
TOTAL	90	107	197		

Out of 102 patients between the ages of 18 years and 25 years, 63 (61.76%) suffered from intense postoperative pain, while 39 (38.24%) did not. In contrast, among 95 patients aged over 50, 44 (46.32%) experienced severe postoperative pain, with 51 (53.68%) reporting no severe pain. These findings imply that younger patients are more prone to experiencing severe postoperative pain compared to their older counterparts, suggesting that age might influence postoperative pain levels (Table 2, Figure 1).

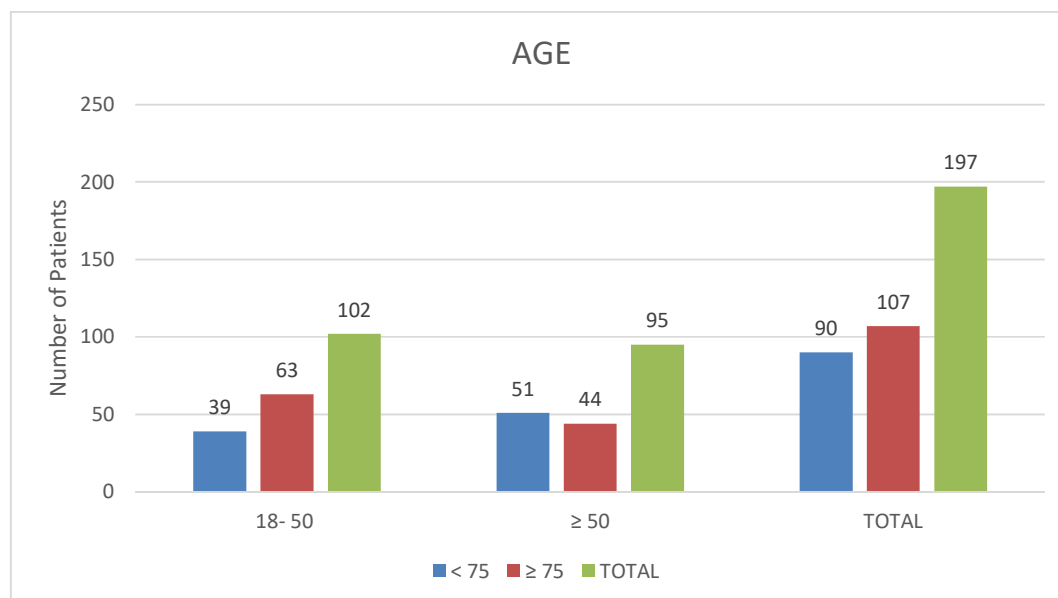
Fig 1: Association of AGE with Mean VAS (*Visual Analogue Scale*) score

Table 3: Association of GENDER with Mean VAS (*Visual Analogue Scale*) score

GENDER	MEAN VAS		TOTAL	p VALUE	INFERENCE
	< 75	≥ 75			
MALE	64	60	124	0.0294	S
FEMALE	26	47	73		
TOTAL	90	107	197		

Out of 124 male patients, 60 (48.39%) experienced severe postoperative pain, while 64 (51.61%) did not. Conversely, among the 73 female patients, 47 (64.38%) developed severe postoperative pain, while 26 (35.62%) did not (Table 3, Figure 2). This indicates a higher proportion of female patients experiencing severe postoperative pain compared to male patients.

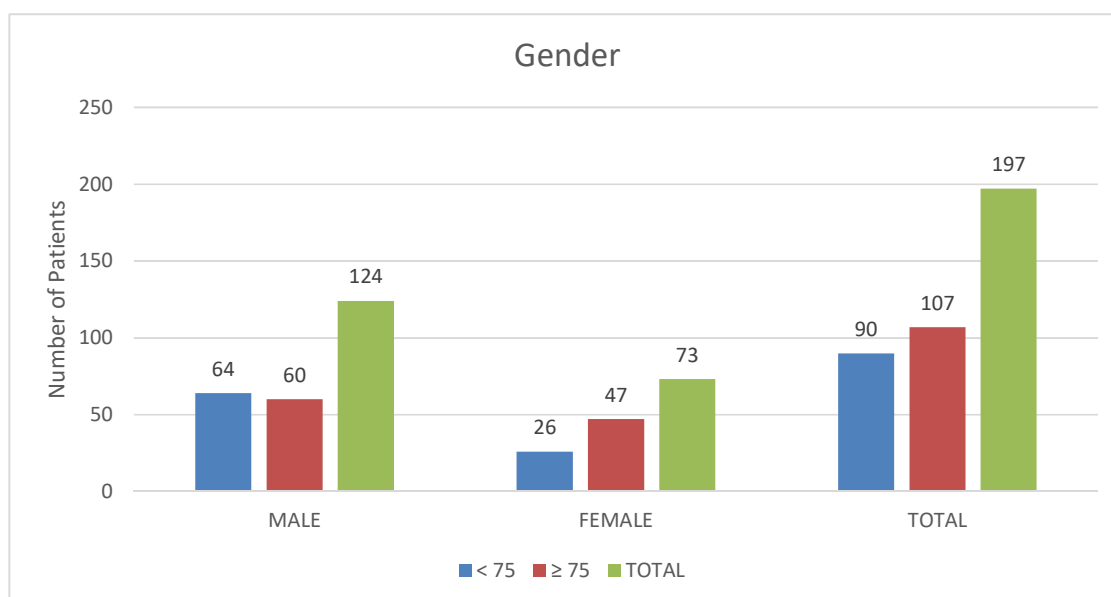
Fig 2: Association of GENDER with Mean VAS (*Visual Analogue Scale*) score

Table 4: Association of EDUCATION STATUS with Mean VAS (*Visual Analogue Scale*) score

EDUCATION	MEAN VAS		TOTAL	P VALUE	INFERENCE
	< 75	≥ 75			
Illiterate	10	15	25	0.3745	NS
Primary School	8	15	23		
Secondary School	20	28	48		
High School	19	23	42		
College Graduate and Higher	33	26	59		
TOTAL	90	107	197		

In a study involving 197 patients, the relationship between educational level and the incidence of severe pain was examined. The distribution of educational levels among the patients included 25 illiterate individuals, 23 with primary school education, 48 with secondary school education, 42 with high school education, and 59 who attended college or higher educational institutions. Among these groups, 60% of illiterate patients (15 out of 25), 65.22% of primary school-educated patients (15 out of 23), 58.33% of secondary school-educated patients (28 out of 48), 54.76% of high school-educated patients (23 out of 42), and 44.07% of college-educated patients (26 out of 59) experienced severe pain. Although the data suggested a trend where higher educational attainment might correlate with a lower incidence of severe pain, a chi-square test was performed to assess the statistical significance of these observations. The resulting p-value was 0.375, indicating no statistically significant association

between educational level and severe pain incidence. Thus, the variations in severe pain percentages across different educational levels are likely due to random variation rather than a systematic effect of education. (Table 4, Figure 3).

Fig 3: Association of EDUCATION STATUS with Mean VAS (Visual Analogue Scale) score

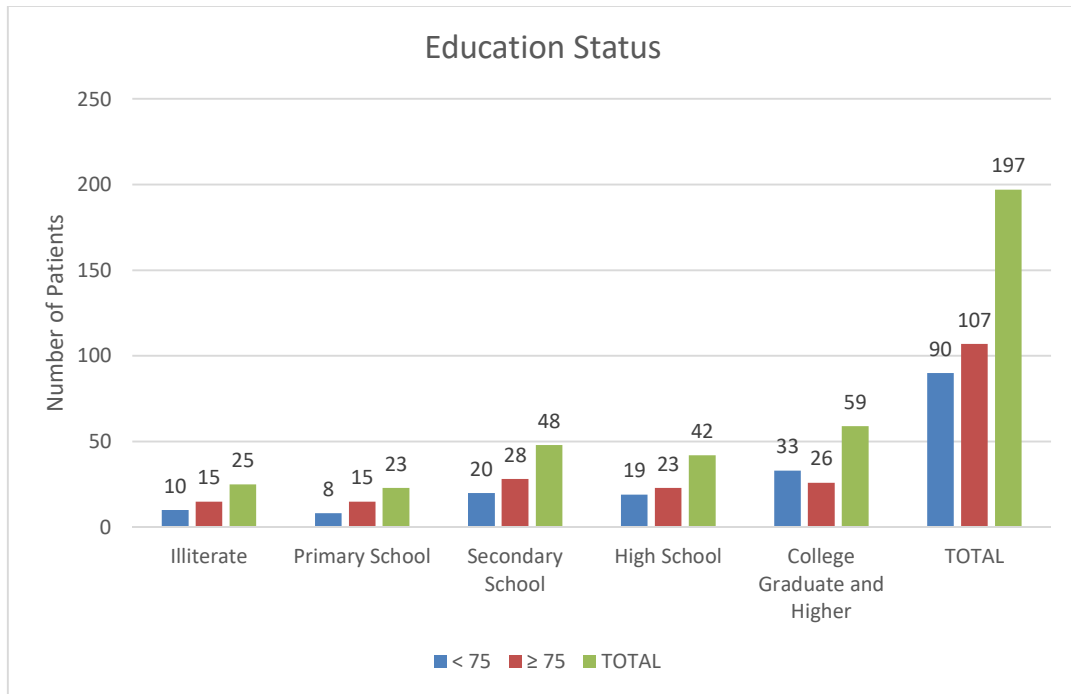
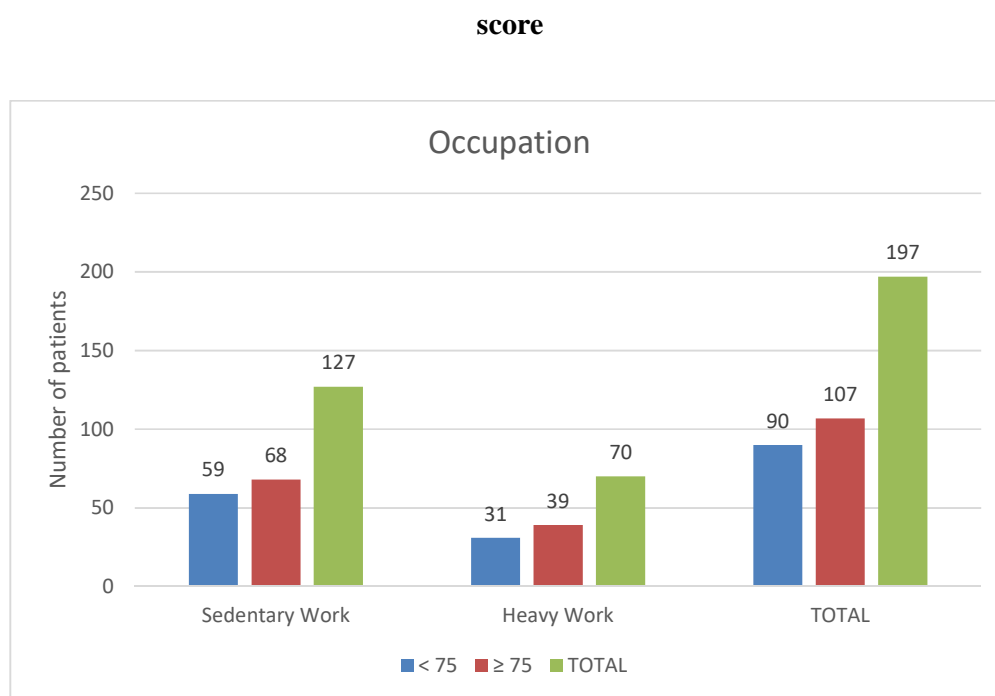


Table 5: Association of OCCUPATION with Mean VAS (Visual Analogue Scale) score

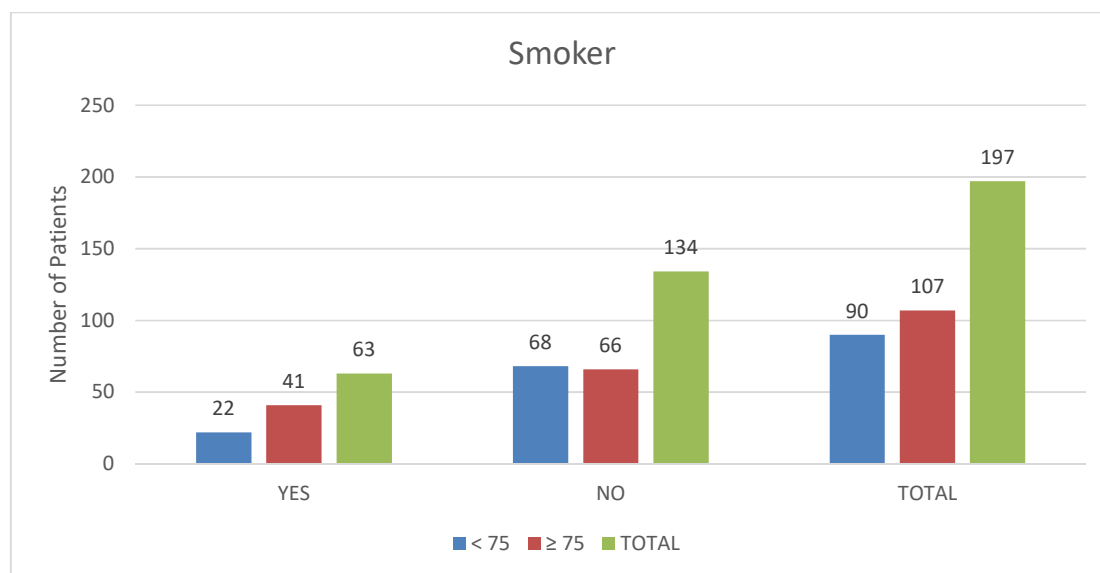
OCCUPATION	MEAN VAS		TOTAL	P VALUE	INFERENCE
	< 75	≥ 75			
Sedentary Work	59	68	127	0.7696	NS
Heavy Work	31	39	70		
TOTAL	90	107	197		

A total of 197 patients were categorized based on their type of work: 127 in sedentary work and 70 in heavy work. Among sedentary workers, 53.54% (68 out of 127) experienced severe post-operative pain (VAS > 75), while among heavy workers, 55.71% (39 out of 70) reported similar pain levels. The computed p-value for assessing the association between type of work and severe pain was approximately 0.769. This p-value suggests that there is no statistically significant association between the type of work and the likelihood of experiencing severe post-operative pain. Therefore, based on the analysis, we do not find sufficient evidence to conclude that the type of work significantly influences the incidence of severe post-operative pain as measured by the VAS scale in this sample. (Table 5, Figure 4).

Fig 4: Association of OCCUPATION with Mean VAS (Visual Analogue Scale)**Table 6: Association of SMOKER with Mean VAS (Visual Analogue Scale) score**

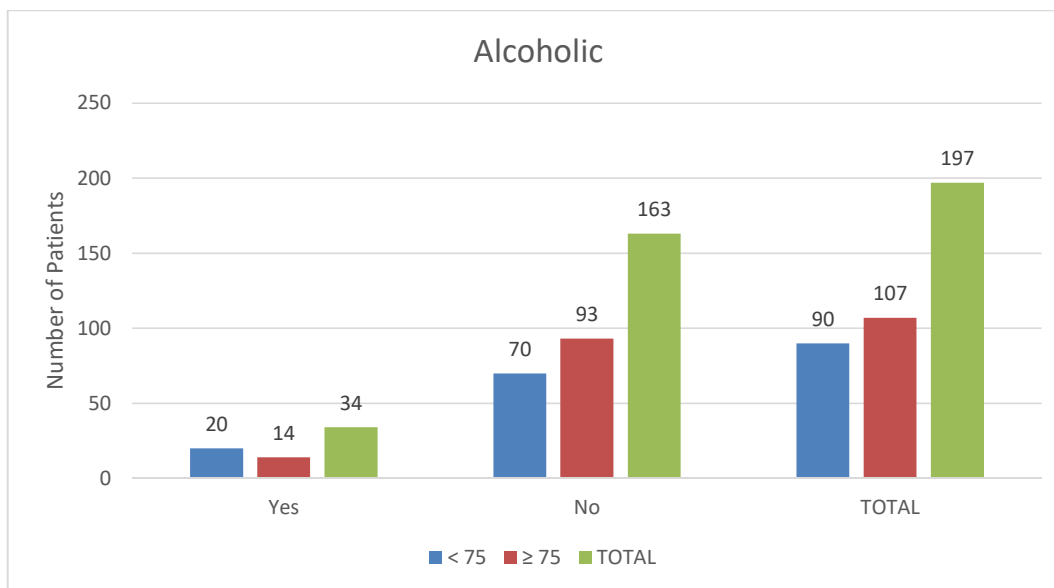
SMOKER	MEAN VAS			p VALUE	INFERENCE
	< 75	≥ 75	TOTAL		
YES	22	41	63	0.0375	S
NO	68	66	134		
TOTAL	90	107	197		

Out of the total 63 patients with a history of smoking, 41 (65.08%) experienced severe postoperative pain, while 22 (34.92%) did not. In contrast, among patients with no smoking history, 66 (49.25%) developed severe postoperative pain, while 68 (50.75%) did not (Table 6, Figure 5). This suggests a higher likelihood of experiencing severe postoperative pain among patients with a history of smoking compared to those without such a history.

Fig 5: Association of SMOKERS with Mean VAS (*Visual Analogue Scale*) score**Table 7: Association of ALCOHOLIC with Mean VAS (*Visual Analogue Scale*) score**

Alcoholic	MEAN VAS			p VALUE	INFERENCE
	< 75	≥ 75	TOTAL		
YES	20	14	34	0.0908	NS
NO	70	93	163		
TOTAL	90	107	197		

The table shows the distribution of alcohol consumption among study subjects in relation to their mean Visual Analog Scale (VAS) scores. Subjects are divided into those who consume alcohol and those who do not, with VAS scores categorized as less than 75 and 75 or greater. Among alcohol consumers, 20 had VAS scores below 75 and 14 had scores of 75 or above. Among non-alcohol consumers, 70 had VAS scores below 75 and 93 had scores of 75 or above. The p-value of 0.0908 indicates no statistically significant association between alcohol consumption and mean VAS scores in this study. (Table 7, Figure 6)

Fig 6: Association of ALCOHOLIC with Mean VAS (Visual Analogue Scale) score**Table 8: Association of HISTORY OF DIABETES MELLITUS with Mean VAS (Visual Analogue Scale) score**

HISTORY OF DIABETES MELLITUS	MEAN VAS			p VALUE	INFERENCE
	< 75	≥ 75	TOTAL		
YES	27	49	76	0.0232	S
NO	63	58	121		
TOTAL	90	107	197		

Out of the total 121 patients who did not have a history of diabetes, 58 patients (47.93%) developed severe postoperative pain, while 63 patients (52.07%) did not. Conversely, among the 76 patients who were known cases of diabetes, 49 patients (64.47%) developed severe postoperative pain, while 27 patients (35.53%) did not (Table 8, Figure 7). This suggests a higher likelihood of experiencing severe postoperative pain among patients with a history of diabetes compared to those without such a history.

Fig 7: Association of HISTORY OF DIABETES MELLITUS with Mean VAS (Visual Analogue Scale) score

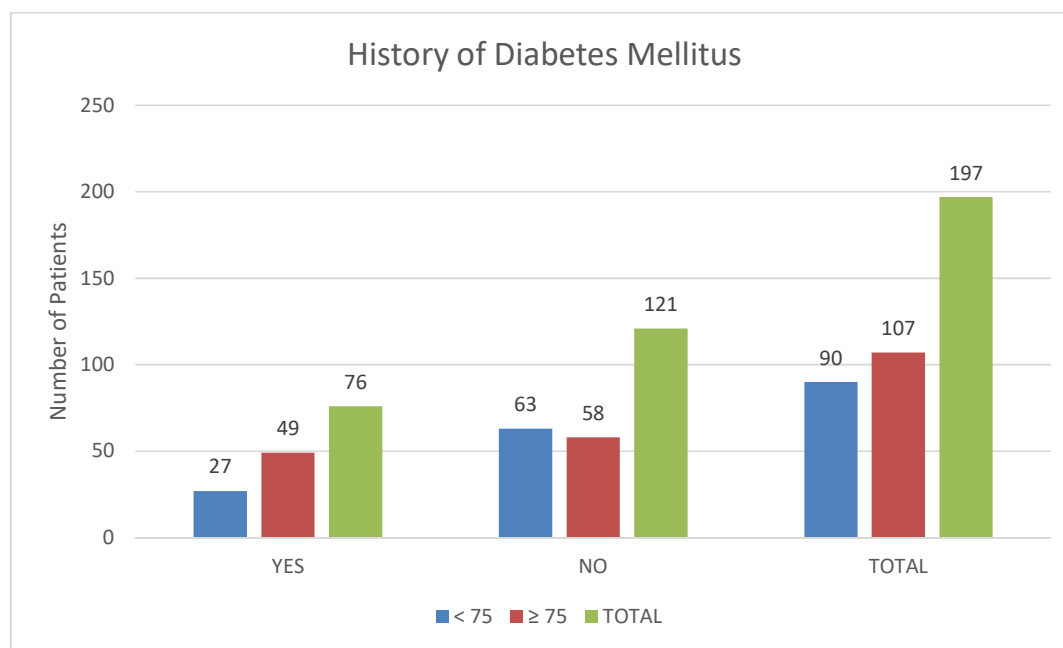
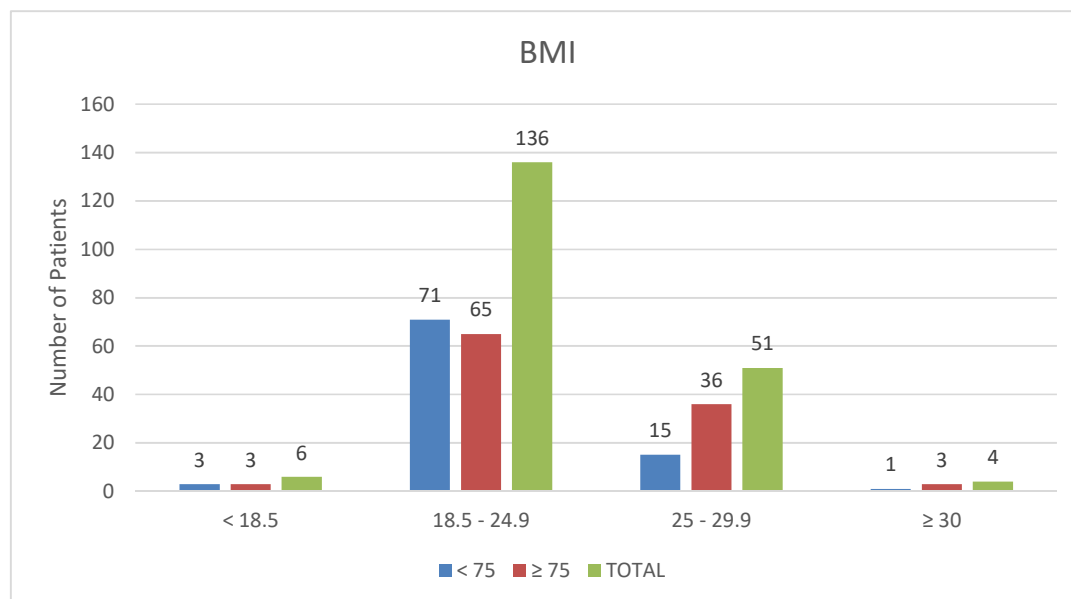


Table 9: Association of BMI with Mean VAS (Visual Analogue Scale) score

BMI	MEAN VAS			p VALUE	INFERENCE
	< 75	≥ 75	TOTAL		
< 18.5	3	3	6	0.0365	S
18.5 - 24.9	71	65	136		
25 - 29.9	15	36	51		
≥ 30	1	3	4		
TOTAL	90	107	197		

There were 51 patients in the study group with a BMI of 25-29.9 (Overweight) and 4 patients with a BMI of 30 or higher (Obese), totalling 55 patients with a BMI above the normal range. Among the overweight patients, 36 (70.59%) developed severe pain, and among the obese patients, 3 (75%) experienced severe pain. Most patients had a BMI within the normal range (18.5-24.9). Among them, 47.10% (65 patients) reported severe pain, while 52.90% (71 patients) did not report severe pain. Only 6 patients were in the underweight range (BMI \leq 18.5), with 3 (50%) experiencing severe pain and 3 (50%) not experiencing such discomfort. These findings suggest that individuals with a BMI exceeding the normal range have a higher risk of experiencing intense postoperative pain than those with a normal or below-normal BMI. (Table 9, Figure 8).

Fig 8: Association of BMI with Mean VAS (*Visual Analogue Scale*) score



**Table 10: Association of HISTORY OF PREVIOUS SURGERY with Mean VAS
(Visual Analogue Scale) score**

SURGERY PREVIOUSLY	MEAN VAS		TOTAL	p VALUE	INFERENCE
	< 75	≥ 75			
YES	29	37	66	0.7269	NS
NO	61	70	131		
TOTAL	90	107	197		

The table examines the relationship between mean Visual Analog Scale (VAS) scores and the history of previous surgeries among the study subjects. Subjects are categorized based on whether they had undergone previous surgery and their VAS scores, either below 75 or 75 and above. Of the subjects with a history of previous surgery, 29 had VAS scores below 75 and 37 had scores of 75 or above. In contrast, among those with no history of previous surgery, 61 had VAS scores below 75 and 70 had scores of 75 or above. The p-value of 0.7269 indicates no statistically significant association between the history of previous surgery and mean VAS scores. (Table 10, Figure 9)

Fig 9: Association of HISTORY OF PREVIOUS SURGERY with Mean VAS (Visual Analogue Scale) score

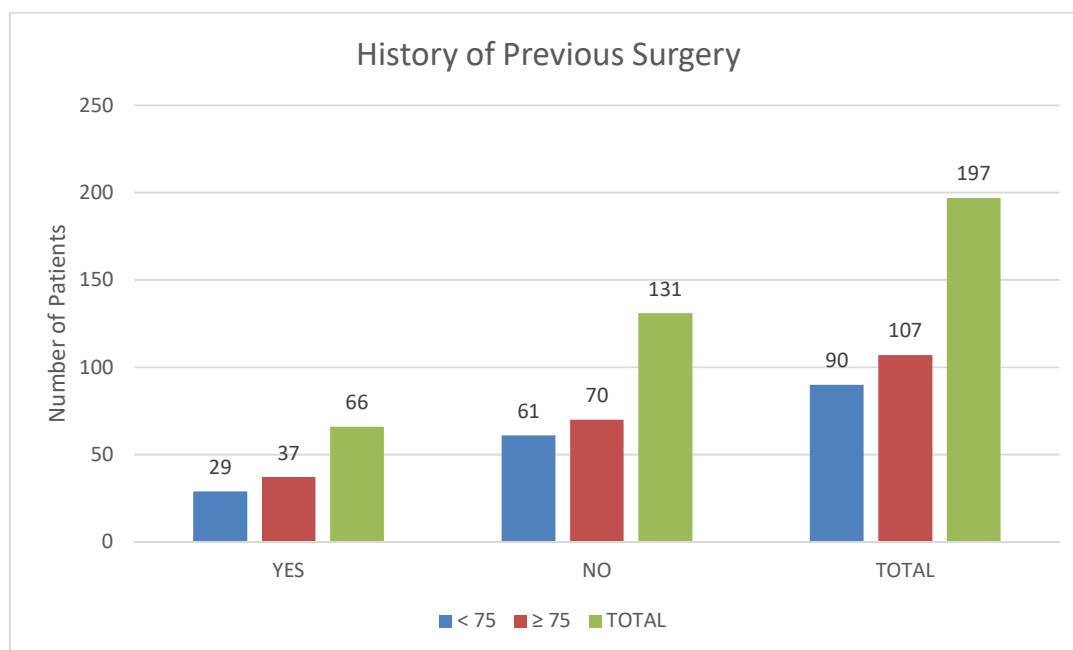


Table 11: Association of history of ANXIETY with Mean VAS (Visual Analogue Scale) score

	MEAN VAS			p VALUE	INFERENCE
	< 75	≥ 75	TOTAL		
SEVERE ANXIETY					
YES	5	17	22	0.0218	S
NO	85	90	175		
TOTAL	90	107	197		

Of the 175 patients without a history of anxiety, 90 patients (51.43%) experienced severe postoperative pain, while 85 patients (48.57%) did not. In contrast, among the 22 patients with a history of anxiety, 17 patients (77.27%) developed severe postoperative pain, while 5 patients (22.73%) did not (Table 11, Figure 10). This

indicates that individuals who have previously dealt with anxiety are at a higher risk of encountering intense postoperative pain compared to those without such a background.

Fig 10: Association of history of ANXIETY with Mean VAS (*Visual Analogue Scale*) score

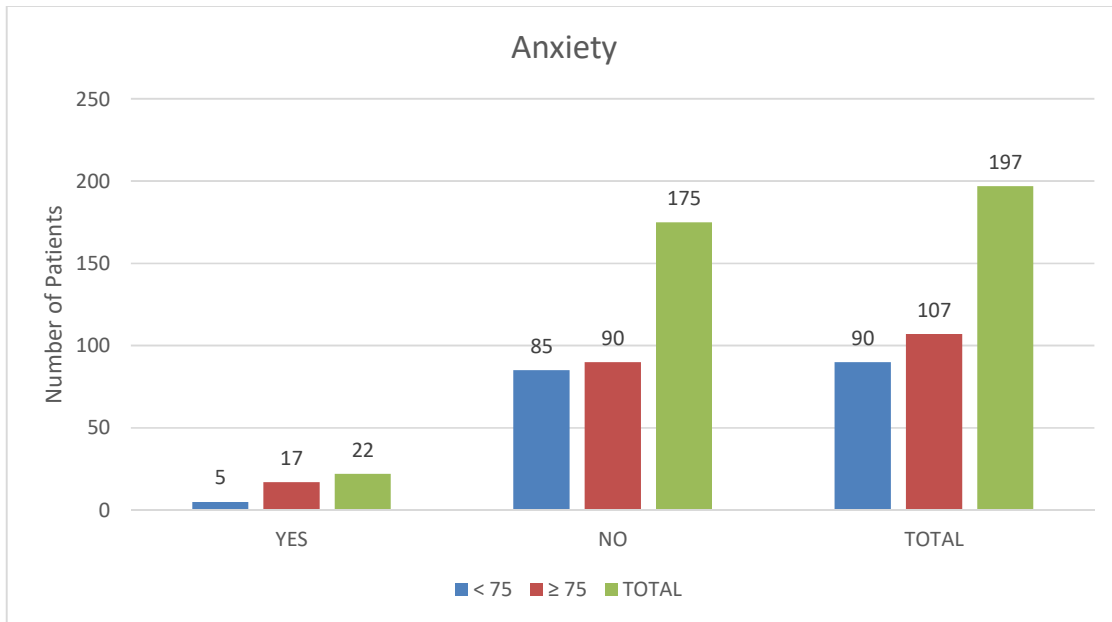


Table 12: Association of history of DEPRESSION with Mean VAS (*Visual Analogue Scale*) score

DEPRESSION	MEAN VAS		TOTAL	p VALUE	INFERENCE
	< 75	≥ 75			
YES	4	14	18	0.0360	S
NO	86	93	179		
TOTAL	90	107	197		

Out of the 18 patients with a history of depression, 14 patients (77.78%) developed severe postoperative pain, while 4 patients (22.22%) did not. Conversely, among the 179 patients without a history of depression, 93 patients (52.01%) experienced severe postoperative pain, while 86 patients (47.99%) did not (Table 12, Figure 11). This suggests a significant difference in the probability of encountering intense postoperative pain among patients with a history of depression compared to those without. Specifically, those with a history of depression appear to have a substantially higher risk of experiencing severe pain following surgery compared to those without such a history.

Fig 11: Association of history of DEPRESSION with Mean VAS (*Visual Analogue Scale*) score

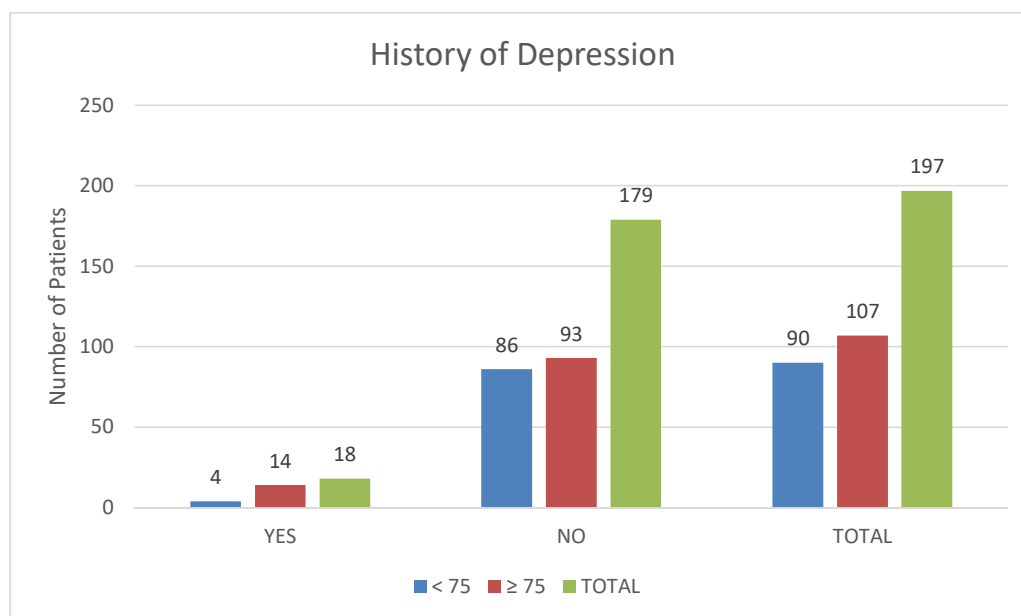


Table 13: Association of FRACTURE SITE with Mean VAS (*Visual Analogue Scale*) score

FRACTURE SITE	MEAN VAS		TOTAL	p VALUE	INFERENCE
	< 75	≥ 75			
Upper Limb	28	16	58	0.47965	NS
Lower Limb	49	59	118		
Clavicle	11	6	17		
Pelvis	1	1	2		
Other	1	1	2		
TOTAL	90	107	197		

The table presents the association between the mean Visual Analog Scale (VAS) scores of study subjects and their fracture site, with VAS scores divided into less than 75 and 75 or greater. For fractures of the upper limb, 28 subjects had VAS scores below 75 and 16 had scores of 75 or above. For lower limb fractures, 49 subjects had scores below 75 and 59 had scores of 75 or above. For lower limb fractures, 49 subjects had scores below 75 and 59 had scores of 75 or above. Clavicle fractures had 11 subjects with scores below 75 and 6 with scores of 75 or above. Both pelvis and other fracture sites each had 1 subject in both VAS score categories. The p-value of 0.47965 indicates no statistically significant association between the fracture site and mean VAS scores among the study subjects. (Table 13, Figure 12)

Fig 12: Association of FRACTURE SITE with Mean VAS (*Visual Analogue Scale*) score

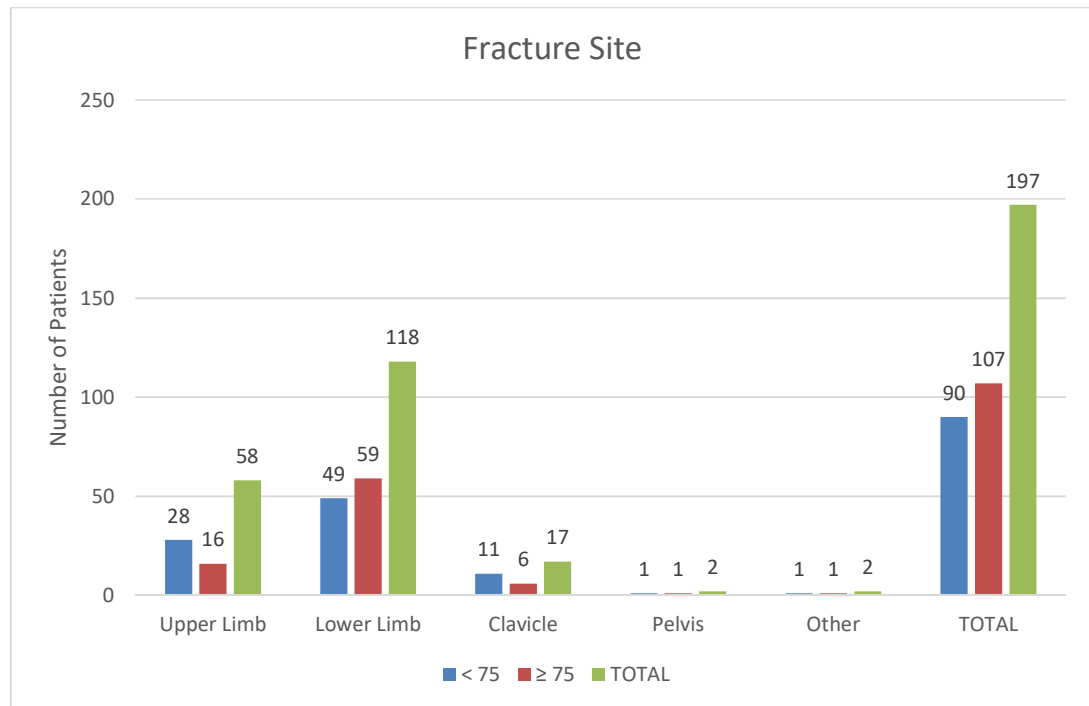


Table 14: Association of PRE-OPERATIVE ANALGESIA with Mean VAS
(Visual Analogue Scale) score

Pre-OP Analgesia	MEAN VAS		TOTAL	p VALUE	INFERENCE
	< 75	≥ 75			
NSAIDs	29	35	64	0.681	NS
Opioid	7	8	15		
Both	10	18	28		
Other	44	46	90		
TOTAL	90	107	197		

The table examines the association between mean Visual Analog Scale (VAS) scores and the type of pre-operative analgesia administered to study subjects. The VAS scores are categorized into less than 75 and 75 or greater. Among those who received NSAIDs, 29 had VAS scores below 75 and 35 had scores of 75 or above. For subjects who received opioids, 7 had scores below 75 and 8 had scores of 75 or above. Those who received both NSAIDs and opioids included 10 subjects with scores below 75 and 18 with scores of 75 or above. In the "Other" analgesia category, 44 had scores below 75 and 46 had scores of 75 or above. The p-value of 0.681 indicates no statistically significant association between the type of pre-operative analgesia and mean VAS scores (Table 14, Figure 13).

Fig 13: Association of PRE-OPERATIVE ANALGESIA with Mean VAS (*Visual Analogue Scale*) score

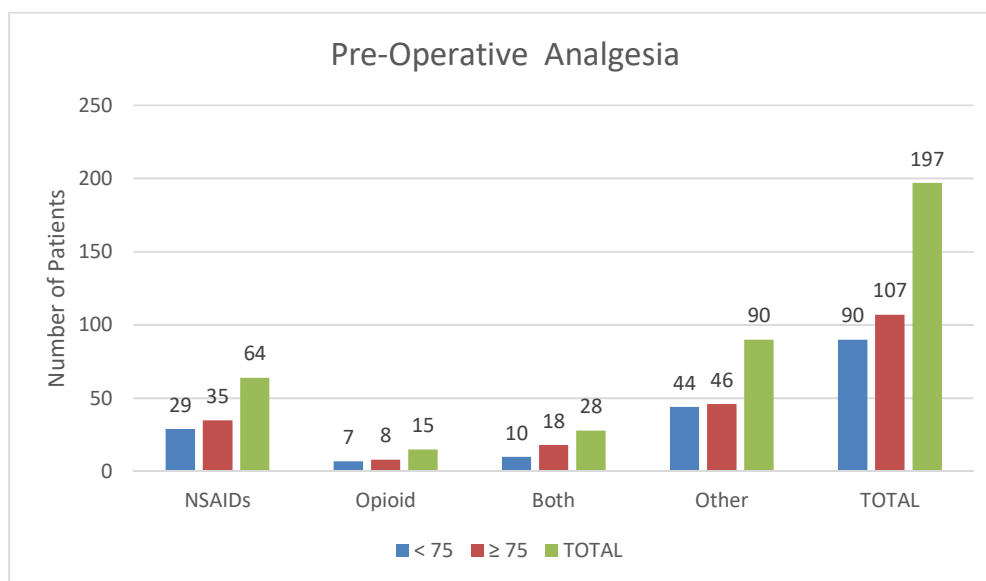


Table 15: Association of ASA (AMERICAN SOCIETY OF ANAESTHESIOLOGISTS) STATUS with Mean VAS (*Visual Analogue Scale*) score

ASA Status	MEAN VAS			p VALUE	INFERENCE
	< 75	≥ 75	TOTAL		
1	55	54	109	0.214	NS
2	31	43	74		
3	4	10	14		
TOTAL	90	107	197		

The table explores the relationship between mean Visual Analog Scale (VAS) scores and the American Society of Anaesthesiologists (ASA) status among study subjects, with VAS scores categorized as less than 75 and 75 or greater. For ASA status 1, 55 subjects had VAS scores below 75 and 54 had scores of 75 or above. In ASA status 2,

31 subjects had scores below 75 and 43 had scores of 75 or above. For ASA status 3, 4 subjects had scores below 75 and 10 had scores of 75 or above. The p-value of 0.214 indicates no statistically significant association between ASA status and mean VAS scores among the subjects. (Table 15, Figure 14)

Fig 14: Association of ASA (AMERICAN SOCIETY OF ANAESTHESIOLOGISTS) STATUS with Mean VAS (*Visual Analogue Scale*) score

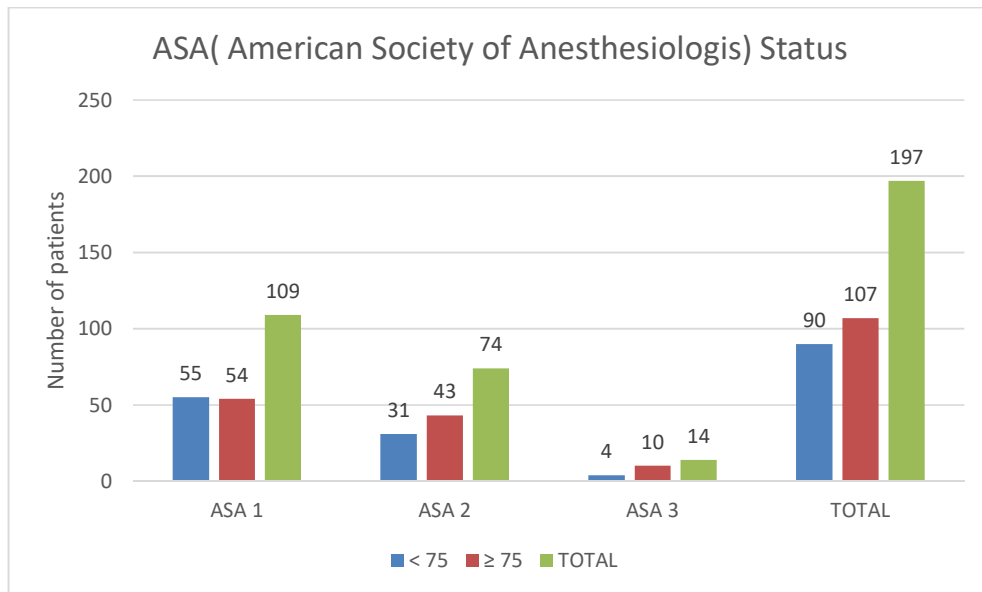


Table 16: Association of PRE-OPERATIVE PAIN with Mean VAS (*Visual Analogue Scale*) score

PREOPERATIVE PAIN BASED ON VAS SCALE	MEAN VAS		TOTAL	p VALUE	INFERENCE
	< 75	≥ 75			
Mild pain	23	3	26	< 0.00001	HS
Moderate pain	48	29	77		
Severe Pain	19	75	94		
TOTAL	90	107	197		

Among the 94 patients who experienced severe preoperative pain based on the VAS Scale, 75 patients (79.79%) developed severe postoperative pain, while 19 patients (20.21%) did not, having a pain score of less than 75. Conversely, of the 103 patients who had mild to moderate preoperative pain, 32 patients (31.06%) developed severe postoperative pain, while 71 patients (68.94%) did not (Table 16, Figure 15). This data highlights a significant link between the intensity of pain before surgery and the probability of experiencing severe pain afterward. Patients who report severe pain before surgery are notably more prone to experiencing severe postoperative pain compared to those with less intense preoperative pain.

Fig 15: Association of PRE-OPERATIVE PAIN with Mean VAS (*Visual Analogue Scale*) score

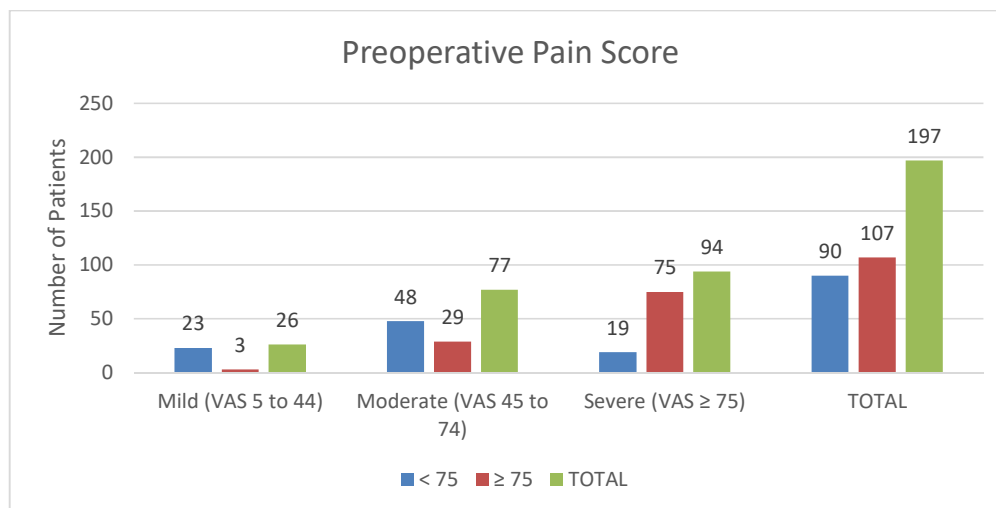


Table 17: Association of URGENCY OF SURGERY with Mean VAS (*Visual Analogue Scale*) score

URGENCY OF SURGERY	MEAN VAS		TOTAL	p VALUE	INFERENCE
	< 75	≥ 75			
Emergency	46	82	128	0.00018	HS
Elective	44	25	69		
TOTAL	90	107	197		

Among the 128 patients who underwent emergency orthopaedic procedures, 82 (64.06%) experienced severe postoperative pain, while 46 (35.94%) did not. Conversely, of the 69 patients who underwent elective orthopaedic procedures, 25 (36.23%) developed severe postoperative pain, whereas 44 (63.77%) did not. This data suggests that patients undergoing emergency procedures experience more severe postoperative pain compared to those undergoing elective procedures, implying that the immediacy of the procedure could impact pain outcomes. (Table 17, Figure 16)

Fig 16: Association of URGENCY OF SURGERY with Mean VAS (*Visual Analogue Scale*) score

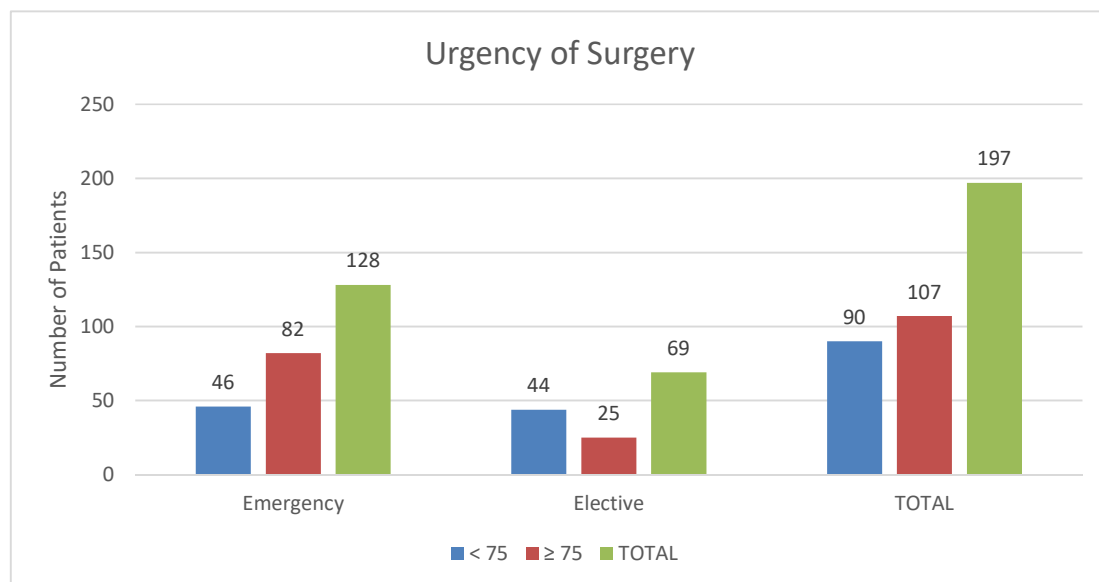
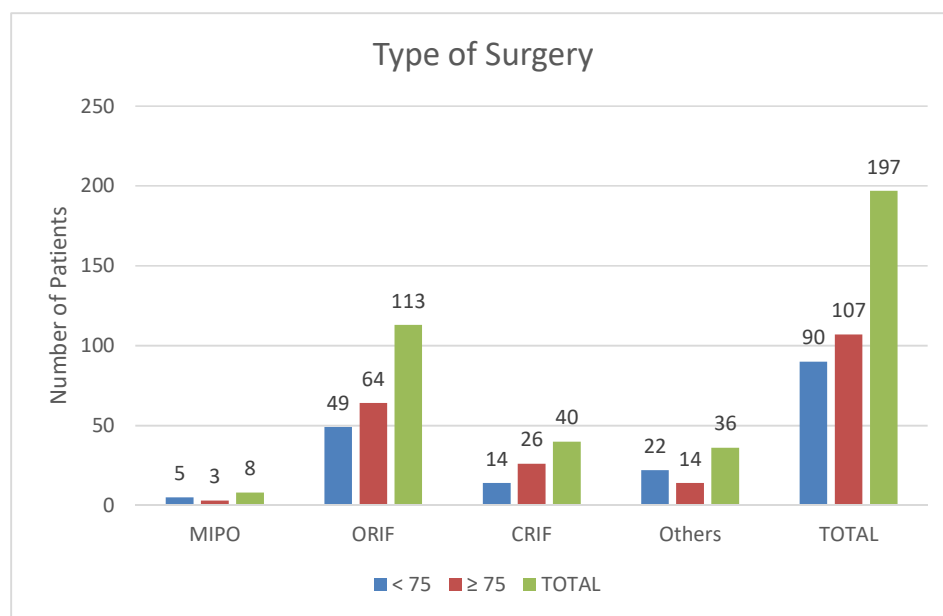


Table 18: Association of TYPE OF SURGERY with Mean VAS (*Visual Analogue Scale*) score

TYPE OF SURGERY	MEAN VAS		TOTAL	P VALUE	INFERENCE
	< 75	≥ 75			
1	5	3	8	0.09165	NS
2	49	64	113		
3	14	26	40		
4	22	14	36		
TOTAL	90	107	197		

The table presents the association between the mean Visual Analog Scale (VAS) score of study subjects and the type of surgery they underwent. The surgeries are categorized as MIPO, ORIF, CRIF, and Others, with VAS scores divided into two groups: less than 75 and 75 or greater. The MIPO group had 5 subjects with VAS scores below 75 and 3 subjects with scores 75 or above, showing no significant difference ($p = 0.09165$). The ORIF group had the highest number of subjects (49 below 75 and 64 at or above 75), followed by CRIF (14 below 75 and 26 at or above 75), and Others (22 below 75 and 14 at or above 75). The p-value indicates no statistically significant association between the type of surgery and mean VAS score across the groups. (Table 18, Figure 17)

Fig 17: Association of TYPE OF SURGERY with Mean VAS (*Visual Analogue Scale*) score



**Table 19: Association of TYPE OF ANAESTHESIA GIVEN with Mean VAS
(Visual Analogue Scale) score**

TYPE OF ANESTHESIA GIVEN	MEAN VAS		TOTAL	p VALUE	INFERENCE
	< 75	≥ 75			
General Anesthesia	14	30	44	0.0361	S
Regional Anesthesia	76	77	153		
TOTAL	90	107	197		

Patients were administered either general anaesthesia or regional anaesthesia, with 153 patients receiving regional anaesthesia and 44 receiving general anaesthesia. Among the group of patients receiving general anaesthesia, 77 patients (50.33%) developed severe postoperative pain, while 76 patients (49.67%) did not experience such severe postoperative pain. In contrast, among the patients who received regional anaesthesia, 30 patients (68.18%) developed severe postoperative pain, while 14 patients (31.82%) did not (Table 19, Figure 18). This data suggests a higher incidence of severe postoperative pain among patients who received general anaesthesia compared to those who received regional anaesthesia.

Tab 18: Association of TYPE OF ANAESTHESIA GIVEN with Mean VAS (Visual Analogue Scale) score

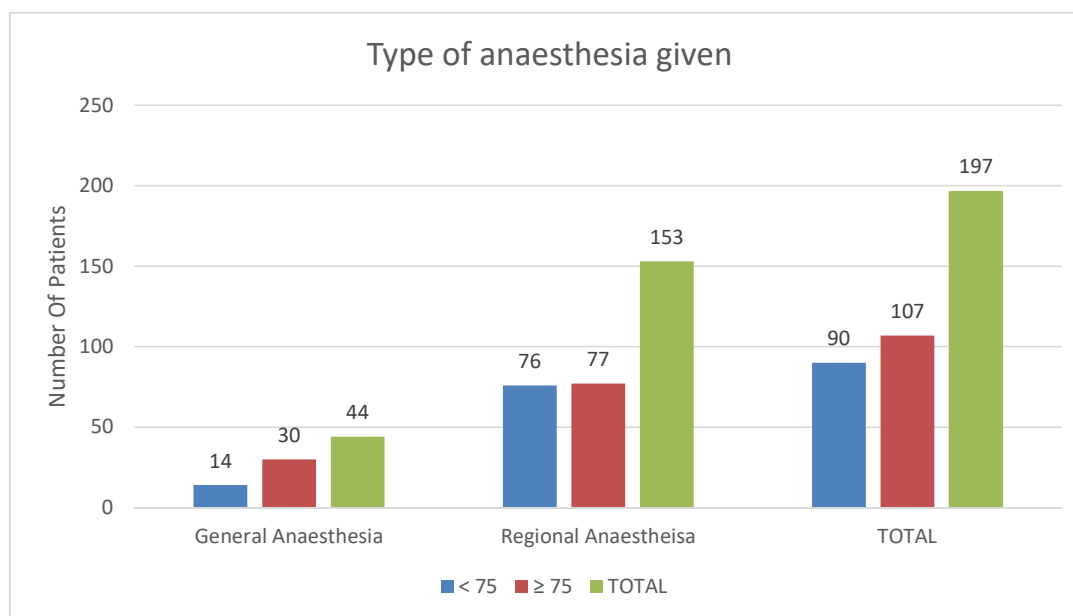


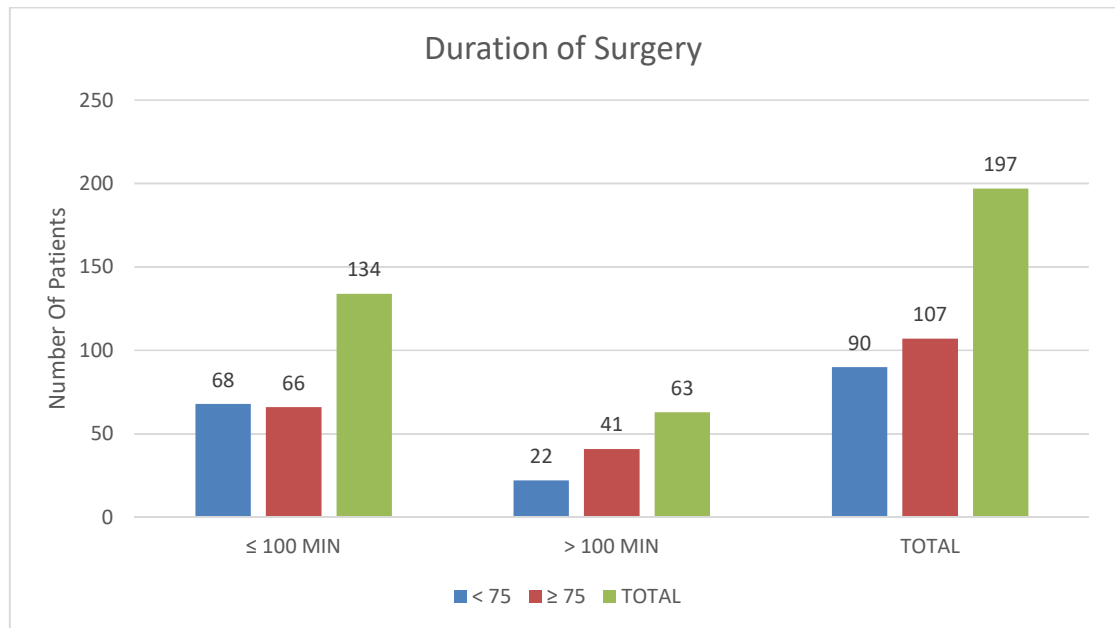
Table 20: Association of DURATION OF SURGERY with Mean VAS (Visual Analogue Scale) score

DURATION OF SURGERY	MEAN VAS			p VALUE	INFERENCE
	< 75	≥ 75	TOTAL		
≤ 100 MIN	68	66	134	0.0375	S
> 100 MIN	22	41	63		
TOTAL	90	107	197		

Among the total of 134 patients whose surgical procedure lasted less than 100 minutes, 66 patients (49.25%) developed severe postoperative pain, while 68 patients (50.75%) did not, having a pain score of less than 75. In contrast, for the 63 patients whose surgical procedure lasted more than 100 minutes, 41 patients (65.08%)

developed severe postoperative pain, while 22 patients (34.92%) did not (Table 20, Figure 19). This data indicates a greater frequency of intense postoperative pain among patients whose surgeries exceeded 100 minutes in duration, as opposed to those with shorter surgical procedures.

**Fig 19: Association of DURATION OF SURGERY with Mean VAS
(Visual Analogue Scale) score**



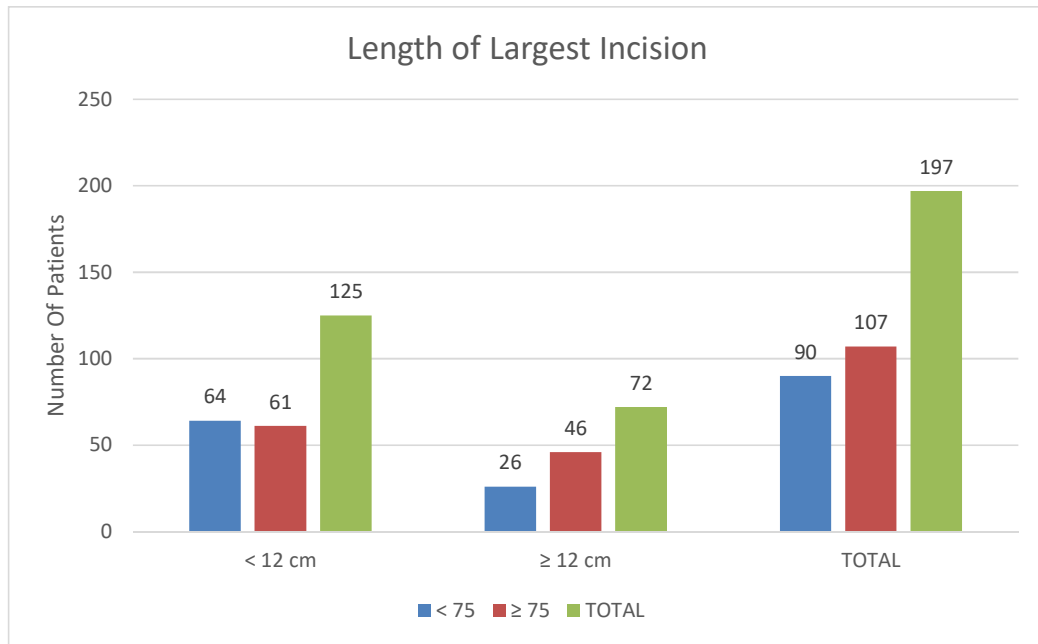
Tab 21: Association of LENGTH OF LARGEST INCISION with Mean VAS

LENGTH OF LARGEST INCISION	MEAN VAS		TOTAL	p VALUE	INFERENCE
	< 75	≥ 75			
< 12 cm	64	61	125	0.0406	S
≥ 12 cm	26	46	72		
TOTAL	90	107	197		

(Visual Analogue Scale) score

There was a total of 72 patients where the length of the largest surgical incision exceeded 12 cm. Among them, 46 patients (63.89%) developed severe postoperative pain, while 26 patients (36.11%) did not, having a pain score of less than 75. In contrast, for the 125 patients whose surgical incision was less than 12 cm, 61 patients (48.80%) developed severe postoperative pain, while 64 patients (51.20%) did not (Table 21, Figure 20). This data indicates that there's a greater likelihood of experiencing severe postoperative pain with longer surgical incisions in comparison to shorter ones.

Fig 20: Association of LENGTH OF LARGEST INCISION with Mean VAS
(Visual Analogue Scale) score



DISCUSSION

After a major orthopaedic treatment, our study looked at 20 different preoperative and some perioperative predictors for severe postoperative pain in an attempt to find meaningful predictors. Of these, 12 preoperative predictors were found to have an impact on pain management following surgery. These predictors cover a wide range of variables, such as lifestyle decisions, surgical considerations, and demographic data. Predictors of poor postoperative pain control include several factors. These are **young age**, **female sex**, and **smoking**. Additionally, a history of **depressive** and **anxiety** symptoms, a higher **body mass index (BMI)**, and the presence of **pre-operative pain** contribute to worse outcomes. Patients with a **diabetic history**, those undergoing **longer surgeries**, or those with **larger skin incisions** are also at higher risk. The **type of anaesthesia** used and whether the surgery was an **emergency procedure** are further significant predictors.

Other factors that did not give us a statistically significant result included educational status, history of alcoholism, history of previous surgeries, site of fracture, any preoperative analgesics given, American Society of Anaesthesiologists (ASA) status of the patient, type of orthopaedic surgery, be it an open reduction technique or a closed reduction technique, or arthroscopic or mini open surgery.

Postoperative pain management following orthopaedic surgery has been an ongoing global concern, as demonstrated by multiple prior studies that document deficiencies and persistently high **incidence rates** between 20% and 80%⁽⁶⁹⁾. In a sample of 197 patients who underwent orthopaedic procedure, our study found that 54% of patients had severe postoperative pain, with 107 of those patients experiencing severe pain after surgery. The vast range of reported incidences is demonstrated by

longitudinal research carried out in United States of America (USA). In contrast to the results of our investigation, the USA study revealed that “the incidence of moderate to severe postoperative pain in orthopaedic surgery reached 80% within the first 24-48 hours following surgery”^(70,71). A possible explanation for this discrepancy could be that, unlike our study, the USA study had a larger sample size and examined moderate to severe postoperative pain, whereas our focus was on severe postoperative pain. Similar to our findings, a Norwegian study ⁽¹²⁾ found that approximately 60% of patients had moderate-to-severe post-operative pain following an orthopaedic surgery.

An intriguing observation is that preoperative pain emerged as one of the most dependable predictors of intense pain during the early postoperative period. Out of the 107 patients experiencing severe postoperative pain (VAS > 75), 75 had also reported experiencing severe pain before their surgery, with a p-value of less than 0.00001. Two reasonable theories could be taken into consideration to explain this phenomenon. Firstly, Chronic noxious input before surgery can sensitize the nervous system, leading to heightened excitability. This process involves upregulation of receptors, potentially amplifying pain perception postoperatively, aligning with current pain neuroscience emphasizing central sensitization's role in perpetuating and intensifying pain ⁽⁷²⁾. Second, the observed predictive value is influenced by both the patient's preoperative pain experience and the psychological effects of the upcoming surgery ^(51,73).

According to a study by Arefayne et al. (2020), (74) patients who experienced pain before surgery were 7.92 times more likely to suffer from moderate to severe pain after surgery.⁽⁷⁴⁾ In another study there were similar findings relating pre-operative pain and post-operative ⁽⁶⁹⁾, with an ‘odd ratio of 2.42 and 95% CI. A prospective study conducted in France with 109 patients found that those experiencing untreated

moderate to severe pain before surgery were more likely to experience postoperative pain following orthopaedic injuries. ^(75,76)

According to this study, patients who experienced trauma and who underwent **emergency orthopaedic surgery** reported more intense pain than those who had elective orthopaedic surgery. One possible explanation is that sudden and unexpected trauma meant there was less time to treat preoperative pain and increased psychological discomfort, worry, and terror. This increased fear and anxiety could cause the patient to become more fearful of pain and increase suffering both before and after surgery. We recommend after trauma, patients requiring emergency orthopaedic surgery need comprehensive pain management plans that take into account both the psychological and physical components of pain. In a 2020 multicentre study by Arefayne et al., ⁽⁷⁴⁾ it was found that 70.5% of patients who underwent emergency orthopaedic surgeries reported experiencing moderate to severe pain after their operations. Similar findings have been found in other studies which have correlated pain with younger age. ^(20,77,78)

The gender difference in postoperative pain management that has been noted is particularly noteworthy. Our research is consistent with earlier studies that show **women** to have higher pain scores ^(20,79–82). Furthermore, compared to men, women have higher chances of having inadequate postoperative pain management. This finding is consistent with research that shows sex differences in pain perception and experience are caused by intricate psychosocial and biological processes ⁽²⁰⁾. The greater susceptibility to inadequate postoperative pain management may be attributed to women's greater readiness to disclose their discomfort and their reported subjective variations in pain perception. Furthermore, it was noted that in order to provide sufficient postoperative analgesia, females needed 11% higher average dosages of

morphine than males⁽⁸³⁾. It is imperative to acknowledge these gender-based variations in order to customise pain management approaches throughout the perioperative phase.

Younger age was another important factor that our study revealed; those under 50 (but older than 18) were shown to be more likely to experience inadequate pain management following surgery. One Possible explanation could be younger age patients are more apprehensive to pain. Even though age and sex are typically *non modifiable risk variables*, understanding how they relate to postoperative pain might be useful in predicting pain trajectories and determining the specific analgesic needs of each patient throughout the perioperative phase. Study by van Dijk et al. (2021)⁽⁸⁴⁾ found that postoperative pain decreases with increasing age based on their retrospective cohort association study. Other studies have also suggested young age as a predictor for more severe postoperative pain.^(20,25,85)

Moving beyond demographic factors, lifestyle choices emerged as modifiable risk factors influencing postoperative pain outcomes. This study identified smoking as a major risk factor for inadequate pain management. These results emphasize the need for future research to evaluate the impact of programs on pre-operative cessation of smoking to control post-operative pain. Recognizing smoking as a modifiable risk factor suggests that targeted interventions could enhance pain outcomes. The complex relationship between smoking and postoperative pain intensity underscores the importance of evaluating smoking cessation programs in optimizing pain management. Additionally, the study emphasizes the prevalence of acute postoperative pain and its potential progression to chronic pain if not adequately addressed, advocating for holistic approaches considering psychological factors, preexisting pain, and medical conditions^(86,87).

According to this study and a study by Michael M. H. Yang et al.⁽⁸⁵⁾, having a **higher BMI** than 25 was found to be positively linked with experiencing more severe postoperative pain. Research indicates that individuals who are overweight or obese may require different amounts of opioids or analgesics during the postoperative period. Cohen B et al.'s study⁽⁸⁸⁾ suggests that these differences may be due to altered pain perception or variations in the pharmacokinetics and pharmacodynamics of analgesics in patients with higher body mass index.

In addition to lifestyle and demographic factors, the study adds a new dimension to preoperative risk assessment by introducing some perioperative factors, or variables that can be anticipated prior to surgery, like the **size of the incision** and **the expected duration** of the procedure, as independent predictors. While the inclusion of a predictor whose value can only be observed pre- or postoperatively might seem peculiar, the study justifies this by highlighting the reliability of estimating expected incision size in nonemergency or emergency surgeries. Postoperative pain is multifactorial, and this is supported by comparisons with other studies, especially when it comes to large skin incisions and prolonged surgical durations. Large skin incisions have been linked to severe postoperative discomfort, and our investigation supports these findings; nonetheless, the need for nuanced interpretations is highlighted by the variability in study outcomes. A longer surgical procedure may result in more tissue damage and surgical stress, which could hurt patients more immediately after the procedure^(26,74,89).

It has been observed in this study that **general anaesthesia** is a predictor of pain during the initial postoperative phase. Compared to regional anaesthesia, studies have shown that it is associated with higher levels of pain and opioid or analgesic intake. Regional anaesthesia has been shown in a study by Dias et al.⁽⁹⁰⁾ to be

protective, while patients who had general anaesthesia were shown to be in greater discomfort. Anaesthetic pharmacokinetic or pharmacodynamic variations may be the cause of these discrepancies. In order to explain increased pain after general anaesthesia, general anaesthetics have the potential to directly activate nociceptors, sensory neurons that transmit pain information via “TRPA1-type ion channels (Transient receptor potential cation channel, subfamily A, member 1)”⁽⁹¹⁾.

The study is in line with previous research by looking at **diabetes** as a significant factor affecting postoperative pain outcomes. Complications in orthopaedic surgery and increased analgesic requirements are recognised, particularly in uncontrolled diabetes. The strong positive association between pain scores and known diabetes individuals highlights how crucial strict glycaemic management is to achieving the best possible pain results. The study recommends more investigation to fully understand the intricate relationship between diabetes and postoperative pain, paving the way for customised treatments^(92–96)

Moreover, it was discovered that having a **history of anxiety or depression** significantly increased the likelihood of experiencing more severe postoperative pain. This is consistent with previous research showing the complex connection between pain and mental health. It becomes critical to include mental health factors in preoperative assessments, underscoring the necessity for a comprehensive pain management strategy that considers both psychological and physical components^(88,97,98).

The association between demographic factors and postoperative pain remains a topic of interest in medical research, yet findings across studies have yielded some inconsistencies. Notably, demographic factors such as education status and occupation have been explored for their potential impact on postoperative pain intensity. While

some studies, such as the investigation conducted by Lanitis et al. (2015)⁽⁹⁹⁾ found that patients with lower health literacy tend to have difficulties understanding instructions and managing medications, resulting in worse pain outcomes., meta-analyses, like the one conducted by Hui Yun Vivian Ip et al. (2009),⁽²⁰⁾ found that only a limited number of studies identified education status as a significant predictor. The relationship between occupation and postoperative pain scores has not been extensively studied.

Alcoholism, as another demographic factor, has been subject to investigation regarding its potential influence on postoperative pain. Despite some studies, such as the research by Armstrong et al. (2020),⁽¹⁰⁰⁾ indicating a significant association between alcoholism and postoperative pain scores, other studies have failed to find a significant correlation^(85,101). This disparity underscores the need for further research to elucidate the role of alcoholism in postoperative pain outcomes.

The impact of patients' medical history, including previous surgeries, on postoperative pain has also been explored. While studies like Duan et al. (2017)⁽¹⁰²⁾ reported a significant association between a history of previous surgeries and postoperative pain, others, such as Yang et al. (2019)⁽⁸⁵⁾ and Hui Yun Vivian Ip et al. (2009),⁽²⁰⁾ did not find this factor to be significant. Similarly, the significance of fracture site as a predictor of postoperative pain scores has not been shown to be significant in contrast to study by Borys et al. (2018)⁽¹⁰³⁾, found operated region to influence the severity of pain.

Regarding preoperative factors, the type of preoperative analgesia administered to patients has been examined for its impact on postoperative pain. While most studies have suggested that patients given opioid analgesia may experience poorer postoperative pain outcomes,^(23,85,103,104) this study did not find a significant association. Additionally, the American Society of Anaesthesiologists (ASA)

classification, a measure of a patient's preoperative physical status, did not associate with postoperative pain scores in this study or in the meta-analysis by Hui Yun Vivian Ip et al. (2009)⁽²⁰⁾. Similarly, the type of surgery performed, such as open or closed reduction or arthroscopic surgeries, did not significantly associate with postoperative pain in this study or in the study by Pham et al. (2016),⁽¹⁰⁵⁾ although Hui Yun Vivian Ip et al. (2009)⁽²⁰⁾ found it to be significant. These findings highlight the complex interplay of various factors in determining postoperative pain outcomes and underscore the need for further research to elucidate these relationships.

The study's applicability may be restricted due to its single-centre nature and limited number of participants, potentially limiting generalizability to diverse orthopaedic practices and patient populations. The broad age inclusion criteria may overlook age-specific pain differences, suggesting a need for stratification. Subjective pain scores, like the VAS Scale, were used, which may not fully capture pain effects and are prone to biases, emphasizing the need for more nuanced assessment tools. External validity across different regions and cultural variations within India was not addressed. The observational nature of the study, potential confounding factors, and response bias are acknowledged. The exclusion of advanced assessments like genotype testing raises questions for **future research**. While valuable associations and predictors were identified, causality could not be established. The study emphasizes the need for further validation of the prediction rule for severe postoperative pain in diverse settings and acknowledges its focus on easily obtainable predictors, highlighting uncertainties regarding clinical application.

CONCLUSION

This study identifies preoperative predictors for severe postoperative pain in orthopedic surgery, emphasizing demographic, lifestyle, and perioperative factors. Severe preoperative pain and traumatic emergency cases emerged as significant determinants of postoperative pain. Factors such as age, gender, smoking, diabetes, BMI, and mental health conditions play crucial roles in predicting postoperative pain. General anesthesia, longer surgery duration, and larger incision length were also found to affect pain outcomes. The study advocates for comprehensive assessments and targeted interventions to improve pain outcomes, recognizing the multifaceted nature of pain experiences. It underscores the importance of personalized and holistic approaches to pain management to enhance patient outcomes. The study highlights potential consequences of inadequately treated acute pain on long-term function and wellbeing, paving the way for future research and interventions.

SUMMARY

The study investigated preoperative and perioperative predictors of severe postoperative pain in 197 patients who underwent major orthopedic surgeries at KLE's Dr. Prabhakar Kore Hospital & Medical Research Centre in Belagavi over a year. Among the 20 factors examined, 12 preoperative predictors significantly impacted pain management, including young age, female sex, smoking, high BMI, preoperative pain, diabetes, history of anxiety or depression, and longer surgeries with larger incisions. General anesthesia and emergency procedures also correlated with higher pain levels. However, factors like educational status, history of alcoholism, previous surgeries, fracture site, preoperative analgesics, ASA status, and type of orthopedic surgery were not statistically significant.

The study found that 54% of patients experienced severe postoperative pain, highlighting the importance of comprehensive pain management plans. Notably, preoperative pain was a strong predictor of severe postoperative pain. The study's findings are consistent with prior research, suggesting the need for tailored pain management approaches, especially for those with modifiable risk factors like smoking and high BMI. The study's limitations include its single-center design, reliance on subjective pain scores, and potential biases, suggesting a need for further research to validate these findings in diverse settings.

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ANNEXURE I - INFORMED CONSENT FORM

“PREOPERATIVE PREDICTORS OF SEVERE POSTOPERATIVE PAIN IN ORTHOPAEDIC SURGERIES- A HOSPITAL BASED OBSERVATIONAL PROSPECTIVE STUDY”

Name of Student/Principal Investigator:

Name of Guide/Co Investigators:

Objective: The primary objective of this study is to systematically identify significant preoperative predictors of severe postoperative pain in major orthopedic surgeries.

Introduction: Pain is recognized as the fifth vital sign. Number of orthopedic surgeries being performed is increasing drastically. Numerous studies suggest poor acute postoperative pain control is common and often inadequately treated. Which leads to patient’s dissatisfaction and delay in patients’ free mobility or rehabilitation and discharge from the hospital

Hence, it would be desirable to preoperatively distinguish patients who are at high risk for developing severe postoperative pain from those who have low risk. Patients at high risk might benefit from aggressive analgesic recovery from anesthesia. Therefore, interventions either pre-emptively or in the early phase of Postoperative pain may be improved by understanding the preoperative predictors of poor pain control by allowing the use of anticipatory and individualized treatments.

Hence the primary purpose of the present study is to identify the predictors of severe post operative pain in orthopedic patients undergoing surgery.

Explanation of procedure: Patient will be provided with a 20-point questionnaire and which has to be duly filled by the patient and patient will be asked to mark their pain experience on VAS Scale for pain preoperatively and postoperatively on POD0, POD1, POD2.

Withdrawal from participation in the study: Participation in this study is voluntary. You will be free to decide whether to participate in this study or continue participation once enrolled. In case you decide to withdraw your participation, you are free to do so. However, please convey the decision to the principal investigator.

Possible benefits from participating in the study: You will/will not have nor get any benefits by participating in this study. The data gathered will help the population at large.

Possible risks from participating in the study: There are no risks involved in participating in this study.

Privacy and confidentiality: The information collected from you will be coded, to prevent any person from identifying you. Your identity will never be revealed. The data collected from you will be kept confidential and only processed or aggregated data will be used for publication.

Financial incentives: You will not receive any payment for participating in this study.

Authorization for publication of aggregated data: Results obtained after processing of the aggregated data will be published for scientific purposes and or presented to scientific groups. However, your identity will never be revealed.

Questions: In case of any questions with regard to this study, you are free to contact:
Dr Harsha Hegde, Chairperson, Ethical committee of JNMC, 0831-2473777 Extension
4052.

Legal rights: By signing this consent form, we are not waving any of your legal
rights.

CONSENT STATEMENT

I am making a voluntary decision to participate in the study “**PREOPERATIVE PREDICTORS OF SEVERE POSTOPERATIVE PAIN IN ORTHOPAEDIC SURGERIES- A HOSPITAL BASED OBSERVATIONAL PROSPECTIVE STUDY.**” My signature below indicates that I have decided to participate and I have read the information provided above or the information provided above has been read to me in the language that I understand best. I was given the opportunity to ask questions and that they have been answered to my satisfaction.

Name of the participant:

Signature or left thumb impression of the participant:

Name of the witness:

Signature or left thumb impression of the witness:

Name of the investigator:

Signature of the investigator:

ANNEXURE II - PROFORMA

Preoperative predictors of severe postoperative pain in Orthopaedic surgeries- A

One-year Hospital Based Prospective Study

Patient Number-

I.P. Number-

Age-

Sex-

Address-

Phone Number-

Intervention-

Question Numbers	Predictor	Response	Tick on the Box	Response in terms of option number
Q1	Age of the Patient		1) 18- 50 years <input type="checkbox"/> 2) \geq 50 years <input type="checkbox"/>	
Q2	Gender of Patient		1) Male <input type="checkbox"/> 2) Female <input type="checkbox"/>	
Q3	Education Status		1) Illiterate <input type="checkbox"/> 2) Primary School <input type="checkbox"/> 3) Secondary School <input type="checkbox"/> 4) High School <input type="checkbox"/> 5) College graduate & Higher <input type="checkbox"/>	
Q4	Occupation of the Patient		1) Sedentary Work <input type="checkbox"/> 2) Heavy Work <input type="checkbox"/>	

Q5	Does the Patient Smoke?		1)Yes 2)No	<input type="checkbox"/> <input type="checkbox"/>	
Q6	Does the patient drink Alcohol?		1)Yes 2)No	<input type="checkbox"/> <input type="checkbox"/>	
Q7	Is the patient Diabetic		1)Yes 2)No	<input type="checkbox"/> <input type="checkbox"/>	
Q8	BMI of the patient		1)Underweight (<18.5) 2)Normal (18.5-24.9) 3)Overweight (25-29.9) 4)Obese (>30)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Q9	Does the patient have any history of previous surgeries?		1)Yes 2)No	<input type="checkbox"/> <input type="checkbox"/>	
Q10	Does the patient has severe anxiety? (Based On Hamilton Anxiety Rating Scale- HAM-A)		1)Yes 2)No	<input type="checkbox"/> <input type="checkbox"/>	
Q11	Does the patient has depression? (Based On Hamilton Depression Rating Scale- HAM-D)		1)Yes 2)No	<input type="checkbox"/> <input type="checkbox"/>	
Q12	Fracture Site		1)Upper Limb 2)Lower Limb 3)Clavicle 4)Pelvis 5)Other	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Q13	Pre-Operative Analgesic Given		1)NSAIDs 2)Opioid 3)Both 4)Other	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Q14	ASA Class		1)I 2)II	<input type="checkbox"/> <input type="checkbox"/>	

			3)III <input type="checkbox"/>	
			4)IV or higher <input type="checkbox"/>	
Q15	Preoperative Pain Based of VAS Scale		1)No Pain(0-4) <input type="checkbox"/>	
			2)Mild Pain(5-44) <input type="checkbox"/>	
			3)Moderate Pain(45-74) <input type="checkbox"/>	
			4)Severe Pain(74-100) <input type="checkbox"/>	
Q16	Urgency of Surgery		1)Emergency <input type="checkbox"/>	
			2)Elective <input type="checkbox"/>	
Q17	Type Of Surgery		1)MIPO <input type="checkbox"/>	
			2)ORIF <input type="checkbox"/>	
			3)CRIF <input type="checkbox"/>	
			4)Others <input type="checkbox"/>	
Q18	Type Of Anaesthesia to be given during surgery		1)General Anaesthesia <input type="checkbox"/>	
			2)Regional Anaesthesia <input type="checkbox"/>	
			3)Local Anaesthesia <input type="checkbox"/>	
Q19	Duration of Surgery		1)<= 100 mins <input type="checkbox"/>	
			2)> 100 mins <input type="checkbox"/>	
Q20	Length of Largest incision		1)< 12 cm <input type="checkbox"/>	
			2)> 12 cm <input type="checkbox"/>	

VAS Scale for Preoperative Pain



VAS Scale for POD0, POD1, POD2

Post Operative Day 0



POD0 Pain Score- _____

Post Operative Day 1



POD1 Pain Score- _____

Post Operative Day 2



POD2 Pain Score- _____

Hamilton Anxiety Rating Scale (HAM-A)

Reference: Hamilton M. The assessment of anxiety states by rating. *Br J Med Psychol* 1959; 32:50–55.

Rating Clinician-rated

Administration time 10–15 minutes

Main purpose To assess the severity of symptoms of anxiety

Population Adults, adolescents and children

Commentary

The HAM-A was one of the first rating scales developed to measure the severity of anxiety symptoms, and is still widely used today in both clinical and research settings. The scale consists of 14 items, each defined by a series of symptoms, and measures both psychic anxiety (mental agitation and psychological distress) and somatic anxiety (physical complaints related to anxiety). Although the HAM-A remains widely used as an outcome measure in clinical trials, it has been criticized for its sometimes poor ability to discriminate between anxiolytic and antidepressant effects, and somatic anxiety versus somatic side effects. The HAM-A does not provide any standardized probe questions. Despite this, the reported levels of inter-rater reliability for the scale appear to be acceptable.

Scoring

Each item is scored on a scale of 0 (not present) to 4 (severe), with a total score range of 0–56, where <17 indicates mild severity, 18–24 mild to moderate severity and 25–30 moderate to severe.

Versions

The scale has been translated into: Cantonese for China, French and Spanish. An IVR version of the scale is available from Healthcare Technology Systems.

Additional references

Maier W, Buller R, Philipp M, Heuser I. The Hamilton Anxiety Scale: reliability, validity and sensitivity to change in anxiety and depressive disorders. *J Affect Disord* 1988;14(1):61–8.

Borkovec T and Costello E. Efficacy of applied relaxation and cognitive behavioral therapy in the treatment of generalized anxiety disorder. *J Clin Consult Psychol* 1993; 61(4):611–19

Address for correspondence

The HAM-A is in the public domain.

Hamilton Anxiety Rating Scale (HAM-A)

Below is a list of phrases that describe certain feeling that people have. Rate the patients by finding the answer which best describes the extent to which he/she has these conditions. Select one of the five responses for each of the fourteen questions.

0 = Not present, 1 = Mild, 2 = Moderate, 3 = Severe, 4 = Very severe.

- | | |
|---|---|
| <p>1 Anxious mood <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p> <p>Worries, anticipation of the worst, fearful anticipation, irritability.</p> | <p>8 Somatic (sensory) <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p> <p>Tinnitus, blurring of vision, hot and cold flushes, feelings of weakness, pricking sensation.</p> |
| <p>2 Tension <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p> <p>Feelings of tension, fatigability, startle response, moved to tears easily, trembling, feelings of restlessness, inability to relax.</p> | <p>9 Cardiovascular symptoms <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p> <p>Tachycardia, palpitations, pain in chest, throbbing of vessels, fainting feelings, missing beat.</p> |
| <p>3 Fears <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p> <p>Of dark, of strangers, of being left alone, of animals, of traffic, of crowds.</p> | <p>10 Respiratory symptoms <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p> <p>Pressure or constriction in chest, choking feelings, sighing, dyspnea.</p> |
| <p>4 Insomnia <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p> <p>Difficulty in falling asleep, broken sleep, unsatisfying sleep and fatigue on waking, dreams, nightmares, night terrors.</p> | <p>11 Gastrointestinal symptoms <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p> <p>Difficulty in swallowing, wind abdominal pain, burning sensations, abdominal fullness, nausea, vomiting, borborygmi, looseness of bowels, loss of weight, constipation.</p> |
| <p>5 Intellectual <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p> <p>Difficulty in concentration, poor memory.</p> | <p>12 Genitourinary symptoms <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p> <p>Frequency of micturition, urgency of micturition, amenorrhea, menorrhagia, development of frigidity, premature ejaculation, loss of libido, impotence.</p> |
| <p>6 Depressed mood <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p> <p>Loss of interest, lack of pleasure in hobbies, depression, early waking, diurnal swing.</p> | <p>13 Autonomic symptoms <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p> <p>Dry mouth, flushing, pallor, tendency to sweat, giddiness, tension headache, raising of hair.</p> |
| <p>7 Somatic (muscular) <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p> <p>Pains and aches, twitching, stiffness, myoclonic jerks, grinding of teeth, unsteady voice, increased muscular tone.</p> | <p>14 Behavior at interview <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4</p> <p>Fidgeting, restlessness or pacing, tremor of hands, furrowed brow, strained face, sighing or rapid respiration, facial pallor, swallowing, etc.</p> |

Hamilton Depression Rating Scale (HDRS)

Reference: Hamilton M. A rating scale for depression. *J Neurol Neurosurg Psychiatry* 1960; 23:56–62

Rating Clinician-rated

Administration time 20–30 minutes

Main purpose To assess severity of, and change in, depressive symptoms

Population Adults

Commentary

The HDRS (also known as the Ham-D) is the most widely used clinician-administered depression assessment scale. The original version contains 17 items (HDRS₁₇) pertaining to symptoms of depression experienced over the past week. Although the scale was designed for completion after an unstructured clinical interview, there are now semi-structured interview guides available. The HDRS was originally developed for hospital inpatients, thus the emphasis on melancholic and physical symptoms of depression. A later 21-item version (HDRS₂₁) included 4 items intended to subtype the depression, but which are sometimes, incorrectly, used to rate severity. A limitation of the HDRS is that atypical symptoms of depression (e.g., hypersomnia, hyperphagia) are not assessed (see SIGH-SAD, page 55).

Scoring

Method for scoring varies by version. For the HDRS₁₇, a score of 0–7 is generally accepted to be within the normal

range (or in clinical remission), while a score of 20 or higher (indicating at least moderate severity) is usually required for entry into a clinical trial.

Versions

The scale has been translated into a number of languages including French, German, Italian, Thai, and Turkish. As well, there is an Interactive Voice Response version (IVR), a Seasonal Affective Disorder version (SIGH-SAD, see page 55), and a Structured Interview Version (HDS-SIV). Numerous versions with varying lengths include the HDRS₁₇, HDRS₂₁, HDRS₂₉, HDRS₈, HDRS₆, HDRS₂₄, and HDRS₇ (see page 30).

Additional references

Hamilton M. Development of a rating scale for primary depressive illness. *Br J Soc Clin Psychol* 1967; 6(4):278–96.

Williams JB. A structured interview guide for the Hamilton Depression Rating Scale. *Arch Gen Psychiatry* 1988; 45(8):742–7.

Address for correspondence

The HDRS is in the public domain.

Hamilton Depression Rating Scale (HDRS)

PLEASE COMPLETE THE SCALE BASED ON A STRUCTURED INTERVIEW

Instructions: for each item select the one "cue" which best characterizes the patient. Be sure to record the answers in the appropriate spaces (positions 0 through 4).

1 DEPRESSED MOOD (*sadness, hopeless, helpless, worthless*)

- 0 Absent.
 1 These feeling states indicated only on questioning.
 2 These feeling states spontaneously reported verbally.
 3 Communicates feeling states non-verbally, i.e. through facial expression, posture, voice and tendency to weep.
 4 Patient reports virtually only these feeling states in his/her spontaneous verbal and non-verbal communication.

2 FEELINGS OF GUILT

- 0 Absent.
 1 Self reproach, feels he/she has let people down.
 2 Ideas of guilt or rumination over past errors or sinful deeds.
 3 Present illness is a punishment. Delusions of guilt.
 4 Hears accusatory or denunciatory voices and/or experiences threatening visual hallucinations.

3 SUICIDE

- 0 Absent.
 1 Feels life is not worth living.
 2 Wishes he/she were dead or any thoughts of possible death to self.
 3 Ideas or gestures of suicide.
 4 Attempts at suicide (any serious attempt rate 4).

4 INSOMNIA: EARLY IN THE NIGHT

- 0 No difficulty falling asleep.
 1 Complains of occasional difficulty falling asleep, i.e. more than ½ hour.
 2 Complains of nightly difficulty falling asleep.

5 INSOMNIA: MIDDLE OF THE NIGHT

- 0 No difficulty.
 1 Patient complains of being restless and disturbed during the night.
 2 Waking during the night – any getting out of bed rates 2 (except for purposes of voiding).

6 INSOMNIA: EARLY HOURS OF THE MORNING

- 0 No difficulty.
 1 Waking in early hours of the morning but goes back to sleep.
 2 Unable to fall asleep again if he/she gets out of bed.

7 WORK AND ACTIVITIES

- 0 No difficulty.
 1 Thoughts and feelings of incapacity, fatigue or weakness related to activities, work or hobbies.
 2 Loss of interest in activity, hobbies or work – either directly reported by the patient or indirect in listlessness, indecision and vacillation (feels he/she has to push self to work or activities).
 3 Decrease in actual time spent in activities or decrease in productivity. Rate 3 if the patient does not spend at least three hours a day in activities (job or hobbies) excluding routine chores.
 4 Stopped working because of present illness. Rate 4 if patient engages in no activities except routine chores, or if patient fails to perform routine chores unassisted.

8 RETARDATION (slowness of thought and speech, impaired ability to concentrate, decreased motor activity)

- 0 Normal speech and thought.
 1 Slight retardation during the interview.
 2 Obvious retardation during the interview.
 3 Interview difficult.
 4 Complete stupor.

9 AGITATION

- 0 None.
 1 Fidgetiness.
 2 Playing with hands, hair, etc.
 3 Moving about, can't sit still.
 4 Hand wringing, nail biting, hair-pulling, biting of lips.

10 ANXIETY PSYCHIC

- 0 No difficulty.
 1 Subjective tension and irritability.
 2 Worrying about minor matters.
 3 Apprehensive attitude apparent in face or speech.
 4 Fears expressed without questioning.

11 ANXIETY SOMATIC (physiological concomitants of anxiety) such as:

gastro-intestinal – dry mouth, wind, indigestion, diarrhea, cramps, belching
cardio-vascular – palpitations, headaches
respiratory – hyperventilation, sighing
urinary frequency
sweating

- 0 Absent.
 1 Mild.
 2 Moderate.
 3 Severe.
 4 Incapacitating.

12 SOMATIC SYMPTOMS GASTRO-INTESTINAL

- 0 None.
 1 Loss of appetite but eating without staff encouragement. Heavy feelings in abdomen.
 2 Difficulty eating without staff urging. Requests or requires laxatives or medication for bowels or medication for gastro-intestinal symptoms.

13 GENERAL SOMATIC SYMPTOMS

- 0 None.
 1 Heaviness in limbs, back or head. Backaches, headaches, muscle aches. Loss of energy and fatigability.
 2 Any clear-cut symptom rates 2.

14 GENITAL SYMPTOMS (symptoms such as loss of libido, menstrual disturbances)

- 0 Absent.
 1 Mild.
 2 Severe.

15 HYPOCHONDRIASIS

- 0 Not present.
 1 Self-absorption (bodily).
 2 Preoccupation with health.
 3 Frequent complaints, requests for help, etc.
 4 Hypochondriacal delusions.

16 LOSS OF WEIGHT (RATE EITHER a OR b)

- | a) According to the patient: | b) According to weekly measurements: |
|--|---|
| 0 <input type="checkbox"/> No weight loss. | 0 <input type="checkbox"/> Less than 1 lb weight loss in week. |
| 1 <input type="checkbox"/> Probable weight loss associated with present illness. | 1 <input type="checkbox"/> Greater than 1 lb weight loss in week. |
| 2 <input type="checkbox"/> Definite (according to patient) weight loss. | 2 <input type="checkbox"/> Greater than 2 lb weight loss in week. |
| 3 <input type="checkbox"/> Not assessed. | 3 <input type="checkbox"/> Not assessed. |

17 INSIGHT

- 0 Acknowledges being depressed and ill.
 1 Acknowledges illness but attributes cause to bad food, climate, overwork, virus, need for rest, etc.
 2 Denies being ill at all.

Total score:

This scale is in the public domain.

ANNEXURE II - PROFORMA

Patient Number	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20		VAS		VAS Average	Greater Than/Equal to 75
	Age	Gender	Educlaltion	Occupation	Smoke?	Alcoholic?	Diabetic?	BMI	History of Previous Surgery?	Anxiety?	Depression?	Fracture Site	PreOP Analgesic	ASA Class	Preop Pain	Urgency?	Type of surgery?	Type of Anaesthesia?	Duration of Surgery	Length of Incision	POD 0	POD 1	POD 2	Mean of top two	
Answer																									
1	1	1	4	2	1	2	2	2	2	2	2	3	3	1	4	2	2	1	1	1	33	24	11	28.5	FALSE
2	2	1	3	1	2	2	2	2	1	2	2	2	3	1	4	2	2	2	1	2	50	20	15	35	FALSE
3	2	1	4	1	2	2	1	2	1	2	2	2	3	2	4	2	2	2	2	2	80	75	25	77.5	TRUE
4	1	1	5	1	2	1	2	2	2	2	2	2	3	1	4	1	2	2	2	2	60	40	15	50	FALSE
5	2	1	1	2	1	2	2	2	1	2	2	2	3	1	4	2	3	2	1	1	90	80	15	85	TRUE
6	2	1	4	1	2	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2	10	20	10	15	FALSE
7	1	1	4	2	2	2	2	3	2	2	2	2	3	1	3	2	1	2	1	1	40	10	5	25	FALSE
8	2	2	2	1	2	2	1	2	2	2	2	1	1	1	3	2	2	2	1	1	23	15	10	19	FALSE
9	1	1	5	2	2	2	2	3	2	2	2	3	3	1	3	2	2	1	1	1	80	75	30	77.5	TRUE
10	1	1	4	1	2	2	2	2	2	2	2	5	1	2	3	2	2	2	1	2	30	25	20	27.5	FALSE
11	2	1	5	1	2	2	1	2	1	2	2	2	1	3	2	2	2	2	1	2	23	15	12	19	FALSE
12	1	1	5	2	2	2	2	2	1	2	2	1	1	1	3	2	2	2	1	2	30	18	11	24	FALSE
13	2	2	5	1	2	2	1	2	2	2	2	2	1	3	4	2	1	2	1	1	80	70	40	75	TRUE
14	1	2	5	1	2	2	2	3	2	1	2	2	1	1	4	1	3	2	1	1	80	70	45	75	TRUE
15	1	1	3	2	1	1	1	3	2	2	2	1	1	1	3	2	2	2	1	1	25	15	10	20	FALSE
16	1	1	4	2	2	2	2	2	2	1	1	1	1	1	3	2	2	2	1	1	80	70	15	75	TRUE
17	1	2	5	1	2	2	2	2	2	1	2	2	1	1	3	2	2	2	1	1	30	25	10	27.5	FALSE
18	1	1	4	2	2	1	2	2	2	2	2	3	1	1	2	2	2	2	1	1	20	10	5	15	FALSE
19	2	1	2	2	2	2	2	2	2	2	2	3	1	1	3	2	2	2	1	1	25	20	10	22.5	FALSE
20	1	1	4	2	2	2	2	3	2	2	2	2	3	1	3	2	1	2	1	1	40	10	5	25	FALSE
21	2	2	1	1	2	2	1	2	2	2	2	2	3	2	3	1	3	2	1	1	85	80	60	82.5	TRUE
22	2	1	3	2	1	2	1	2	2	2	2	2	3	2	4	1	2	2	2	2	90	85	70	87.5	TRUE
23	1	2	2	1	2	2	2	2	2	2	2	1	1	1	4	1	2	2	1	1	75	70	30	72.5	FALSE
24	2	1	3	2	2	2	2	2	2	2	2	1	1	1	4	1	2	2	1	1	80	75	45	77.5	TRUE

Patient Number	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	VAS	VAS	VAS	Greater Than/Equal to 75	
	Age	Gender	Education	Occupation	Smoke?	Alcoholic?	Diabetic?	BMI	History of Previous Surgery?	Anxiety?	Depression?	Fracture Site	PreOP Analgesic	ASA Class	Preop Pain	Urgency?	Type of surgery?	Type of Anaesthesia?	Duration of Surgery	Length of Incision	POD 0	POD 1	POD 2	Mean of top two	
Answer																									
25	2	1	5	1	2	2	2	2	2	2	2	2	3	2	4	1	2	2	2	2	75	70	40	72.5	FALSE
26	2	2	1	1	2	2	1	2	2	2	2	2	3	2	4	1	3	2	2	1	85	80	60	82.5	TRUE
27	2	2	2	1	2	2	1	2	2	2	2	2	3	1	4	1	2	2	2	2	90	85	80	87.5	TRUE
28	1	1	3	1	2	2	2	2	2	2	2	2	1	1	3	1	3	2	1	1	65	60	40	62.5	FALSE
29	2	1	1	2	1	1	1	2	2	2	2	1	1	2	3	1	2	2	1	1	60	40	25	50	FALSE
30	2	1	5	1	2	2	2	2	2	2	2	2	1	1	4	1	2	2	2	1	85	80	40	82.5	TRUE
31	2	1	3	2	2	2	1	4	1	2	2	2	3	2	4	1	3	2	2	1	95	80	75	87.5	TRUE
32	2	2	1	1	2	2	1	1	2	2	2	2	3	2	4	1	3	2	2	1	90	80	65	85	TRUE
33	2	1	2	1	2	2	1	2	2	2	2	2	1	2	4	1	3	2	2	1	85	75	65	80	TRUE
34	2	1	4	1	2	2	1	2	2	2	2	2	3	1	4	1	2	2	2	2	90	85	80	87.5	TRUE
35	2	2	4	2	2	2	1	3	1	2	2	2	4	2	2	2	2	2	1	2	70	55	40	62.5	FALSE
36	2	1	4	2	2	2	1	3	2	1	1	2	4	2	3	2	2	2	2	2	80	75	62	77.5	TRUE
37	2	1	3	2	1	1	2	2	2	2	2	2	4	1	3	1	2	2	1	2	65	40	25	52.5	FALSE
38	1	1	4	1	2	2	2	2	2	2	2	1	4	1	3	2	4	1	2	1	90	70	60	80	TRUE
39	1	1	3	2	1	2	2	2	2	2	2	2	2	1	3	1	3	2	1	1	85	80	60	82.5	TRUE
40	2	1	5	1	2	2	1	2	2	2	2	1	4	2	3	1	2	2	1	1	70	55	30	62.5	FALSE
41	2	1	4	1	2	2	2	2	2	2	2	2	4	1	4	1	2	2	1	2	90	70	50	80	TRUE
42	1	1	3	2	1	2	2	2	2	2	2	1	1	1	3	1	2	2	1	1	80	70	54	75	TRUE
43	1	1	5	1	1	1	2	2	2	2	2	3	4	1	3	1	2	1	1	1	80	55	40	67.5	FALSE
44	1	2	5	2	2	2	1	3	1	2	2	1	4	2	2	2	4	1	2	1	80	70	45	75	TRUE
45	1	2	4	2	2	2	1	3	2	2	2	2	1	2	4	1	3	2	1	1	85	80	65	82.5	TRUE
46	1	1	4	2	1	1	1	2	2	2	2	2	1	1	3	1	2	2	1	1	70	55	30	62.5	FALSE
47	2	1	3	1	2	2	1	2	2	2	2	2	3	1	4	1	2	1	2	2	80	75	50	77.5	TRUE
48	2	2	5	1	2	2	1	2	2	2	2	1	4	2	3	1	1	1	1	1	75	60	30	67.5	FALSE
49	1	1	5	1	1	2	2	2	1	1	1	2	4	1	3	1	2	2	1	2	80	75	45	77.5	TRUE

Patient Number	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	VAS	VAS	VAS	Greater Than/Equal to 75	
	Age	Gender	Education	Occupation	Smoke?	Alcoholic?	Diabetic?	BMI	History of Previous Surgery?	Anxiety?	Depression?	Fracture Site	PreOP Analgesic	ASA Class	Preop Pain	Urgency?	Type of surgery?	Type of Anaesthesia?	Duration of Surgery	Length of Incision	POD 0	POD 1	POD 2	Mean of top two	
Answer																									
50	2	1	4	1	2	2	1	3	1	1	2	4	2	4	1	2	2	2	1	90	70	45	80	TRUE	
51	2	1	4	1	2	2	2	2	1	2	2	2	1	2	4	1	3	2	1	1	75	60	42	67.5	FALSE
52	2	2	3	1	2	2	2	2	2	2	2	2	1	1	4	1	2	2	1	2	85	80	70	82.5	TRUE
53	1	1	5	1	1	1	2	2	2	2	2	2	1	1	4	1	3	2	1	1	80	75	60	77.5	TRUE
54	1	1	4	2	1	1	2	2	2	2	2	1	4	1	4	1	3	1	2	1	80	75	60	77.5	TRUE
55	1	1	4	2	2	2	1	1	2	2	1	2	1	2	3	1	3	2	1	1	80	70	55	75	TRUE
56	1	1	4	1	1	1	2	2	1	2	2	2	4	1	2	2	4	2	1	1	65	47	30	56	FALSE
57	1	1	5	2	2	2	2	2	2	2	2	2	3	1	4	1	3	2	1	1	85	75	60	80	TRUE
58	2	1	4	2	2	2	2	2	2	2	2	3	4	2	2	2	2	1	2	1	75	70	40	72.5	FALSE
59	2	1	5	2	2	2	1	4	1	2	2	2	4	3	3	2	2	2	1	2	90	85	80	87.5	TRUE
60	1	2	3	2	2	2	1	3	1	2	2	2	2	2	4	1	2	2	2	1	80	75	45	77.5	TRUE
61	1	1	5	1	1	1	2	2	2	2	2	2	1	1	2	2	4	2	1	1	75	60	50	67.5	FALSE
62	2	1	2	1	2	2	1	2	1	2	2	2	4	2	3	2	2	2	2	2	80	70	40	75	TRUE
63	2	2	3	1	2	2	2	3	1	2	2	2	4	3	3	1	2	2	1	2	95	75	50	85	TRUE
64	1	1	5	1	2	2	2	2	2	2	2	2	4	1	4	1	2	2	2	2	80	70	55	75	TRUE
65	1	2	5	2	2	2	2	3	1	2	2	2	1	1	3	2	2	2	1	2	85	70	45	77.5	TRUE
66	2	1	3	1	2	2	2	3	1	2	2	2	4	3	3	1	3	2	1	1	80	70	60	75	TRUE
67	1	1	5	1	1	1	2	2	2	2	2	2	4	1	2	2	4	2	2	2	80	55	30	67.5	FALSE
68	1	1	4	1	1	1	2	2	2	2	2	2	4	1	4	1	2	2	2	1	85	70	50	77.5	TRUE
69	1	1	5	1	2	2	2	2	2	2	2	1	4	1	2	2	4	1	2	1	60	35	25	47.5	FALSE
70	1	2	5	1	2	2	2	2	2	2	2	2	4	1	2	2	4	2	1	1	70	50	30	60	FALSE
71	1	1	5	1	1	1	2	2	2	1	1	2	4	1	3	2	4	2	1	1	60	40	30	50	FALSE
72	1	2	5	1	2	2	1	3	1	2	1	1	1	2	3	2	4	1	1	1	85	70	40	77.5	TRUE
73	2	1	4	2	1	2	2	2	2	2	2	1	4	1	3	1	2	2	1	1	70	55	40	62.5	FALSE
74	2	2	2	1	1	1	2	4	1	1	2	2	4	3	4	1	2	2	1	2	80	70	60	75	TRUE

Patient Number	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	VAS	VAS	VAS	Greater Than/Equal to 75	
	Age	Gender	Education	Occupation	Smoke?	Alcoholic?	Diabetic?	BMI	History of Previous Surgery?	Anxiety?	Depression?	Fracture Site	PreOP Analgesic	ASA Class	Preop Pain	Urgency?	Type of surgery?	Type of Anaesthesia?	Duration of Surgery	Length of Incision	POD 0	POD 1	POD 2	Mean of top two	
Answer																									
75	2	2	3	1	2	2	1	2	1	2	2	2	4	2	4	1	2	2	2	2	85	80	60	82.5	TRUE
76	2	2	5	1	2	2	1	3	1	2	2	2	4	2	3	2	2	2	1	2	80	50	30	65	FALSE
77	2	1	3	2	2	2	1	2	1	2	2	2	4	2	3	1	4	2	1	2	60	40	30	50	FALSE
78	2	1	3	2	2	2	2	2	2	2	2	2	1	1	4	1	2	2	2	1	80	70	50	75	TRUE
79	1	1	5	1	2	2	2	2	1	2	2	2	4	1	2	2	4	1	1	1	70	60	30	65	FALSE
80	1	2	3	2	2	2	2	2	2	2	2	2	4	1	4	1	3	2	1	1	70	50	40	60	FALSE
81	1	1	5	1	2	2	2	2	2	2	2	2	4	1	4	1	2	2	1	1	85	75	60	80	TRUE
82	1	2	5	1	2	2	2	2	2	2	2	2	4	1	3	2	4	2	1	1	80	50	30	65	FALSE
83	2	2	2	1	2	2	2	3	2	2	2	2	1	2	4	1	3	2	1	1	70	65	40	67.5	FALSE
84	2	1	3	2	1	2	2	2	2	2	2	2	2	1	4	1	3	2	1	1	75	70	60	72.5	FALSE
85	2	1	5	1	2	2	2	2	1	2	2	2	4	1	3	1	2	2	1	2	60	40	30	50	FALSE
86	1	2	5	1	2	2	2	2	1	2	2	2	4	1	3	2	4	2	1	1	60	50	30	55	FALSE
87	1	1	5	2	1	1	2	2	2	2	2	1	4	1	3	1	2	2	1	1	70	60	40	65	FALSE
88	2	2	2	1	2	2	1	2	1	2	2	2	4	1	4	1	2	2	1	2	85	75	60	80	TRUE
89	1	2	3	2	2	2	2	3	1	1	1	1	2	1	2	1	4	2	1	1	60	40	35	50	FALSE
90	2	2	3	2	2	2	2	2	1	1	2	2	4	1	4	1	2	2	1	2	80	70	50	75	TRUE
91	2	2	5	1	2	2	1	3	2	2	2	2	4	2	3	2	2	1	1	2	80	70	40	75	TRUE
92	2	1	4	1	2	2	1	3	1	2	2	1	4	2	3	2	4	1	2	1	85	75	40	80	TRUE
93	2	2	3	1	2	2	2	2	1	2	2	1	4	1	3	1	2	2	1	1	60	40	30	50	FALSE
94	1	1	5	1	1	1	2	2	2	2	2	1	4	1	4	1	2	1	2	1	80	70	45	75	TRUE
95	1	1	5	1	2	2	2	2	2	2	2	2	3	1	4	1	2	2	1	1	75	70	50	72.5	FALSE
96	1	1	5	1	1	1	2	2	1	2	2	2	2	1	2	1	2	2	1	1	70	50	30	60	FALSE
97	2	2	4	1	2	2	2	3	1	2	2	2	4	2	3	2	2	2	1	2	75	60	40	67.5	FALSE
98	1	1	5	1	1	1	2	2	2	2	2	1	4	1	3	1	2	2	1	1	55	40	30	47.5	FALSE
99	1	1	4	2	2	2	2	2	2	1	1	2	4	1	3	2	4	2	2	1	85	75	60	80	TRUE

Patient Number	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20		VAS		VAS Average	Greater Than/Equal to 75
	Age	Gender	Education	Occupation	Smoke?	Alcoholic?	Diabetic?	BMI	History of Previous Surgery?	Anxiety?	Depression?	Fracture Site	PreOP Analgesic	ASA Class	Preop Pain	Urgency?	Type of surgery?	Type of Anaesthesia?	Duration of Surgery	Length of Incision	POD 0	POD 1	POD 2	Mean of top two	
Answer																									
100	2	1	3	2	1	2	1	2	2	2	2	1	4	2	3	1	2	2	1	1	60	45	32	52.5	FALSE
101	1	1	5	1	1	1	2	2	2	2	2	2	4	1	2	2	4	2	1	1	80	50	30	65	FALSE
102	1	1	4	2	2	2	2	2	2	2	2	1	4	1	4	1	2	1	2	1	85	65	40	75	TRUE
103	2	1	5	1	1	2	2	2	2	2	2	1	4	2	3	2	4	1	2	1	85	70	50	77.5	TRUE
104	1	1	5	1	1	1	2	2	2	2	2	3	1	1	3	1	2	1	1	1	85	70	50	77.5	TRUE
105	2	2	5	1	2	2	1	3	2	2	2	2	4	2	2	2	2	2	1	2	85	75	70	80	TRUE
106	2	1	3	2	2	2	1	3	1	2	2	1	1	2	4	1	2	2	1	1	87	67	44	77	TRUE
107	1	1	4	1	2	2	2	2	2	1	2	2	2	1	4	1	2	2	2	1	80	70	50	75	TRUE
108	2	1	3	1	2	2	1	3	2	2	2	2	4	2	4	1	2	2	2	2	70	55	50	62.5	FALSE
109	2	2	5	2	2	2	1	2	2	2	2	1	4	2	2	2	4	1	2	1	65	45	35	55	FALSE
110	2	1	2	2	2	2	1	2	2	2	2	2	1	2	4	1	2	2	2	2	85	65	55	75	TRUE
111	2	1	3	2	1	2	2	2	2	2	2	2	4	1	4	1	2	2	1	2	85	80	50	82.5	TRUE
112	1	1	5	1	2	1	2	2	2	1	2	3	4	1	4	1	2	1	1	1	60	40	35	50	FALSE
113	1	1	5	1	2	2	2	2	1	1	1	2	4	1	3	2	4	2	2	1	65	55	30	60	FALSE
114	1	1	5	1	2	2	2	2	2	2	2	4	1	2	2	2	4	2	2	1	70	40	20	55	FALSE
115	2	1	3	1	1	1	2	1	1	1	1	2	4	2	4	1	2	2	2	2	85	80	55	82.5	TRUE
116	1	2	4	1	2	2	2	3	1	2	2	1	2	2	4	1	2	2	2	2	85	70	60	77.5	TRUE
117	2	2	3	1	2	2	1	3	1	2	2	2	4	3	3	1	2	2	2	2	70	60	45	65	FALSE
118	1	1	5	1	1	1	2	3	2	2	2	2	1	1	4	1	2	2	2	2	85	75	60	80	TRUE
119	2	1	3	1	2	2	1	2	1	2	2	2	4	2	3	1	2	2	1	2	85	65	50	75	TRUE
120	2	1	5	1	2	2	2	2	2	2	2	3	4	1	3	1	1	1	1	1	70	50	30	60	FALSE
121	2	1	4	2	2	2	2	2	2	2	2	2	1	1	4	1	3	2	1	1	80	70	55	75	TRUE
122	1	1	4	2	2	2	2	2	2	2	2	2	4	1	4	1	2	2	2	2	80	75	60	77.5	TRUE
123	1	1	5	1	2	2	2	2	2	1	2	2	1	1	4	1	2	2	1	1	85	70	50	77.5	TRUE
124	2	2	3	1	2	2	1	3	1	2	1	2	4	3	4	1	2	2	2	2	85	80	70	82.5	TRUE

Patient Number	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	VAS	VAS	VAS	Greater Than/Equal to 75	
	Age	Gender	Education	Occupation	Smoke?	Alcoholic?	Diabetic?	BMI	History of Previous Surgery?	Anxiety?	Depression?	Fracture Site	PreOP Analgesic	ASA Class	Preop Pain	Urgency?	Type of surgery?	Type of Anaesthesia?	Duration of Surgery	Length of Incision	POD 0	POD 1	POD 2	Mean of top two	
Answer																									
125	1	2	5	1	2	2	2	2	1	2	2	1	1	1	4	1	2	2	1	1	70	45	30	57.5	FALSE
126	1	1	5	1	2	2	2	2	1	2	1	2	2	3	3	2	4	2	2	1	70	60	55	65	FALSE
127	1	2	5	1	2	2	2	2	1	1	1	2	4	1	3	2	4	1	2	1	80	70	40	75	TRUE
128	1	2	5	1	2	2	2	2	2	2	2	1	1	1	2	2	4	1	2	1	70	50	45	60	FALSE
129	1	1	5	1	2	2	2	2	2	2	2	1	1	1	4	1	4	1	2	1	80	70	50	75	TRUE
130	2	2	5	1	2	2	2	2	2	2	2	1	4	1	3	2	4	1	2	1	80	50	40	65	FALSE
131	2	2	3	2	2	2	2	3	1	2	2	2	4	2	4	1	3	2	1	1	90	80	60	85	TRUE
132	1	1	4	1	1	2	2	2	2	2	2	1	2	1	4	1	2	2	2	2	80	70	50	75	TRUE
133	2	2	4	1	1	2	1	4	1	2	2	1	1	2	3	1	2	2	1	1	60	50	30	55	FALSE
134	2	2	5	1	2	2	1	3	1	2	2	2	4	2	2	2	2	2	1	2	80	70	40	75	TRUE
135	1	1	3	1	1	1	2	2	1	2	2	2	4	1	2	2	3	2	1	1	60	50	30	55	FALSE
136	2	2	1	2	1	2	1	2	2	2	2	1	4	2	3	1	2	2	1	1	60	50	30	55	FALSE
137	2	2	3	2	2	2	1	2	2	2	2	2	4	2	4	1	3	2	2	1	80	60	40	70	FALSE
138	2	2	1	2	2	2	2	2	2	2	2	2	4	1	3	1	2	2	1	2	70	55	40	62.5	FALSE
139	1	1	4	2	2	2	2	2	2	2	2	1	4	1	4	1	2	2	2	2	75	65	60	70	FALSE
140	2	2	3	2	2	2	1	3	1	2	2	1	1	2	4	1	2	2	1	1	75	70	60	72.5	FALSE
141	2	1	4	1	2	2	2	2	2	2	2	2	4	1	4	1	3	2	1	1	83	77	65	80	TRUE
142	2	1	1	2	1	2	1	2	2	2	2	2	1	2	4	1	3	2	1	1	67	43	30	55	FALSE
143	2	2	1	2	2	2	1	3	2	2	2	2	4	2	4	1	3	2	1	1	80	70	50	75	TRUE
144	1	1	5	1	1	2	2	2	2	2	2	2	1	1	4	1	3	2	1	1	65	60	40	62.5	FALSE
145	2	1	4	2	1	2	1	2	1	2	2	2	1	2	3	2	2	2	2	2	80	70	50	75	TRUE
146	2	1	3	1	2	2	1	3	1	2	2	2	4	2	4	1	3	2	1	1	60	40	30	50	FALSE
147	2	2	1	1	2	2	1	2	1	2	2	1	4	2	3	1	2	2	1	1	60	50	30	55	FALSE
148	2	2	1	1	2	2	1	3	2	2	2	2	1	2	3	1	3	2	2	2	60	50	40	55	FALSE
149	1	1	4	1	2	2	2	2	2	2	2	2	1	1	3	1	2	2	1	1	75	65	50	70	FALSE

Patient Number	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	VAS	VAS	VAS	Greater Than/Equal to 75	
	Age	Gender	Education	Occupation	Smoke?	Alcoholic?	Diabetic?	BMI	History of Previous Surgery?	Anxiety?	Depression?	Fracture Site	PreOP Analgesic	ASA Class	Preop Pain	Urgency?	Type of surgery?	Type of Anaesthesia?	Duration of Surgery	Length of Incision	POD 0	POD 1	POD 2	Mean of top two	
Answer																									
150	2	2	1	1	2	2	2	2	2	2	2	2	1	1	4	1	2	2	2	2	85	75	60	80	TRUE
151	1	1	5	1	1	1	2	2	2	2	2	2	3	1	4	1	3	2	1	1	90	85	75	87.5	TRUE
152	1	2	5	1	2	2	2	2	2	2	2	1	1	1	3	1	2	2	1	1	80	70	40	75	TRUE
153	1	2	1	1	2	2	1	3	2	2	2	2	4	2	3	2	4	2	1	1	80	70	60	75	TRUE
154	1	2	1	1	2	2	1	2	1	2	2	1	4	2	4	1	1	2	1	2	83	77	60	80	TRUE
155	2	1	1	2	2	2	2	2	2	2	2	3	4	1	3	1	3	1	1	1	70	65	40	67.5	FALSE
156	2	1	3	1	2	1	2	2	1	2	2	2	4	1	2	2	2	2	1	2	60	50	25	55	FALSE
157	2	1	3	1	2	1	1	2	1	2	2	2	1	2	3	2	2	2	1	2	80	60	50	70	FALSE
158	1	2	1	1	1	2	1	3	1	2	2	3	4	2	4	1	2	1	1	1	90	70	50	80	TRUE
159	2	1	4	1	2	2	2	2	2	2	2	2	2	1	2	2	2	2	1	2	78	65	52	71.5	FALSE
160	1	2	3	1	1	2	1	3	1	2	2	3	4	2	4	1	2	1	1	1	88	76	56	82	TRUE
161	2	1	4	1	2	1	1	3	1	2	2	1	2	3	3	2	4	1	2	1	78	50	45	64	FALSE
162	1	2	2	2	1	1	1	2	2	1	1	1	1	2	4	1	2	2	1	2	85	75	60	80	TRUE
163	1	2	2	1	1	1	2	2	2	1	2	1	4	1	4	1	2	1	1	2	80	70	62	75	TRUE
164	1	2	5	1	1	2	2	2	2	2	2	3	1	1	4	1	3	1	1	1	80	75	55	77.5	TRUE
165	2	1	2	1	2	2	1	3	2	2	2	1	4	2	2	2	4	2	2	1	70	50	35	60	FALSE
166	1	1	3	1	1	1	1	3	1	1	1	2	4	3	4	1	3	2	1	1	85	70	55	77.5	TRUE
167	1	2	1	1	1	2	2	3	2	2	2	2	3	1	4	1	3	2	1	2	88	70	45	79	TRUE
168	2	1	2	1	2	2	2	1	1	2	2	1	2	2	3	1	2	2	1	2	60	50	45	55	FALSE
169	1	1	2	1	1	2	1	3	2	2	2	1	1	2	3	2	4	1	1	1	80	75	50	77.5	TRUE
170	1	1	4	1	1	2	1	3	1	1	1	2	4	3	3	2	4	1	1	1	80	70	55	75	TRUE
171	2	1	3	1	2	2	2	1	2	2	2	1	1	1	2	2	4	1	1	1	60	50	35	55	FALSE
172	1	2	1	1	2	2	1	3	2	2	2	2	3	2	4	1	3	2	1	1	85	75	55	80	TRUE
173	1	1	3	1	1	2	2	2	2	2	2	2	1	1	4	1	2	2	1	2	80	70	45	75	TRUE
174	1	1	4	1	1	2	2	2	2	2	2	2	1	1	4	1	1	2	1	1	80	70	45	75	TRUE

Patient Number	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20	VAS	VAS	VAS	Greater Than/Equal to 75	
	Age	Gender	Education	Occupation	Smoke?	Alcoholic?	Diabetic?	BMI	History of Previous Surgery?	Anxiety?	Depression?	Fracture Site	PreOP Analgesic	ASA Class	Preop Pain	Urgency?	Type of surgery?	Type of Anaesthesia?	Duration of Surgery	Length of Incision	POD 0	POD 1	POD 2	Mean of top two	
Answer																									
175	1	2	2	2	2	2	1	3	1	1	2	1	1	2	3	2	4	1	1	1	85	65	55	75	TRUE
176	1	1	3	2	1	1	2	2	2	2	2	2	4	1	4	1	3	2	1	1	80	75	55	77.5	TRUE
177	1	1	3	1	1	2	1	3	1	2	1	1	4	2	4	1	2	2	1	1	88	70	53	79	TRUE
178	1	1	2	1	1	2	1	3	2	2	2	1	1	2	3	2	4	1	2	1	82	75	45	78.5	TRUE
179	1	2	1	2	2	2	1	3	2	2	2	5	3	2	4	1	2	1	2	2	90	75	60	82.5	TRUE
180	1	2	3	2	1	2	1	3	2	2	2	1	1	2	4	1	3	1	1	1	80	70	40	75	TRUE
181	2	1	1	2	2	2	1	2	2	2	2	3	3	2	3	1	3	2	1	1	75	55	40	65	FALSE
182	1	1	2	1	1	2	2	2	2	2	2	1	4	1	4	1	2	2	1	2	80	75	45	77.5	TRUE
183	2	1	2	2	2	2	2	2	2	2	2	2	4	2	3	2	2	2	1	2	70	65	50	67.5	FALSE
184	1	2	1	2	2	2	1	3	1	2	2	4	1	3	4	1	2	1	2	2	80	75	35	77.5	TRUE
185	2	1	2	1	2	2	1	2	2	2	2	3	3	2	3	1	3	2	2	1	60	45	35	52.5	FALSE
186	2	1	4	1	2	2	2	1	2	2	2	2	1	1	3	2	2	2	2	2	80	60	55	70	FALSE
187	1	2	2	2	1	2	2	2	2	2	2	1	3	1	4	1	2	1	1	2	85	70	55	77.5	TRUE
188	1	2	3	1	1	2	2	2	2	2	2	3	2	1	4	1	2	1	1	1	88	72	50	80	TRUE
189	1	2	3	2	1	2	2	2	2	2	2	1	2	1	4	1	4	1	1	2	80	70	55	75	TRUE
190	2	1	1	2	2	2	2	2	2	2	2	1	4	1	2	2	4	2	2	1	75	65	40	70	FALSE
191	1	2	1	1	1	2	1	3	1	2	2	1	1	2	4	1	2	1	1	2	85	70	55	77.5	TRUE
192	1	2	3	1	1	2	2	2	2	2	2	1	2	1	4	1	2	1	1	2	90	70	60	80	TRUE
193	2	1	3	1	2	2	2	2	1	2	2	2	1	1	3	2	2	2	1	2	75	60	50	67.5	FALSE
194	1	2	1	1	1	2	2	2	1	2	2	1	4	1	4	1	2	2	1	2	85	70	45	77.5	TRUE
195	2	1	1	2	2	2	2	2	2	2	2	3	3	2	3	1	1	2	1	1	65	50	35	57.5	FALSE
196	1	1	2	2	1	1	2	2	2	2	2	2	1	1	4	1	2	2	1	2	80	75	60	77.5	TRUE
197	1	2	2	2	2	2	1	2	2	2	2	2	3	3	4	1	3	2	1	1	80	70	50	75	TRUE