MMM COLLEGE OF HEALTH SCIENCES

(AFFILIATED TO THE TAMILNADU DR. M.G.R MEDICAL UNIVERSITY)

INTERNSHIP PROGRAMME
AT
THE MADRAS MEDICAL MISSION HOSPITAL

A REPORT ON
"MULTIMODAL ANALGESIA STRATEGIES FOR CARDIAC SURGERY"

UNDER THE GUIDANCE OF

DR. P. SHANMUGA PERUMAL
MD, DNB (ANESTHESIOLOGY), FRCA (LONDON), CCT IN ANESTHESIA (UK), MMM, CHENNAI

SUBMITTED BY

N.CHARULATHA
B.SC OPERATION THEATRE AND ANESTHESIA TECHNOLOGY
800220502501

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DECLARATION

I hereby declare that the project report entitled "**MULTIMODAL ANALGESIA STRATEGIES FOR CARDIAC SURGERY**" is submitted in partial fulfillment of the requirements for the degree of bachelor of science– **OPERATION THEATRE AND ANESTHESIA TECHNOLOGY** is my original work and is carried out under the guidance of **DR. P. SHANMUGA PERUMAL MD, DNB (ANESTHESIOLOGY), FRCA (LONDON), CCT IN ANESTHESIA**

DATE: MAY 2025 **Signature of the candidate**

CERTIFICATE

This is to certify that this project report titled **“MULTIMODAL ANALGESIA STRATEGIES FOR CARDIAC SURGERY”** is the bonafide work of **MS. CHARULATHA .N REG NO:800220502501** who carried out the project under my supervision for the fulfillment of the course internship of **B.Sc. OPERATION THEATRE AND ANESTHESIA TECHNOLOGY** Programme

Signature of the Project Guide	**Signature of the Head of Institute**

Signature of the Project Co-Guide

ACKNOWLEDGEMENT

I thank God almighty, for having showered his choicest blessings on me and for having helped me in overcoming all the obstacles which I faced in the completion of this project.

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Words fail me to express my appreciation to many individuals who were important to the successful realization of this project. I would like to thank all of them and express my apologies for not mentioning them.

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ABBREVATIONS

ABBREVATIONS

GA – GENERAL ANAESTHESIA

BPM – BEATS PER MINUTE

MMHG – MILLIMETERS OF MERCURY

MAP – HEART RATE

SBP – SYSTOLIC BLOOD PRESSURE

MAP – DIASTOLIC BLOOD PRESSURE

MAP – MEAN ARTERIAL PRESSURE

SPO2 – PERIPHERAL OXYGEN SATURATION

MG – MILLIGRAM

MCG – MICROGRAM

KG – KILOGRAM

TTMB-TRANSERVERUS THORACIS MUSCLE PLANE BLOCK

PVB-PARAVERTEBRAL BLOCK

ESP- ERECTOR SPINAE BLOCK

PIFB- PECTO-INTERCOSTAL FASCIAL PLANE BLOCK

BSA – BODY SURFACE AREA

ASA – AMERICAN SOCIETY OF ANAESTHESIA

ABSTRACT

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BACKGROUND:

Effective postoperative pain management is crucial in patients undergoing cardiac surgery, as inadequate pain control can lead to significant morbidity, delayed recovery, respiratory complications, and prolonged hospital stay. However, opioid-based analgesia is associated with several adverse effects such as respiratory depression, nausea, vomiting, constipation, pruritus, and the risk of opioid dependence.Multimodal analgesia (MMA) has emerged as a superior strategy. MMA involves the use of a combination of different analgesic agents and techniques that act on various pain pathways, aiming to achieve synergistic pain control while minimizing side effects. In cardiac surgery, this approach often integrates the use of non-opioid medications like NSAIDs, acetaminophen, gabapentinoids, regional anesthesia techniques (such as paravertebral blocks, erector spinae plane blocks), and low-dose opioids.

AIM:

The aim of this study is to evaluate and optimize multimodal analgesia strategies for postoperative pain management in patients undergoing cardiac surgery

OBJECTIVES:

. 1. To assess the efficacy of multimodal analgesia strategies in reducing postoperative pain intensity and opioid consumption in cardiac surgery patients.

2. To evaluate the impact of multimodal analgesia strategies on postoperative recovery, including length of stay in ICU, complications, and patient satisfaction.

METHOD:

This prospective study includes 200patients of both genders undergoing elective Cardiac surgery .Patients were divided into two groups .Group I patients undergoes block Group II patients undergoes non block Hemodynamics of each group were monitored and compared with receival hemodynamics of patients,dose of fentanyl used ,dose of morphine used, pain score for out comes and results were analyzed.

RESULT:

Demographic Characteristics Age: Statistically significant difference ($p = 0.047$) Group differences observed. Weight & Height: No statistically significant difference ($p > 0.05$) – Comparable between groups. Fentanyl Use: Mean ± SD significantly lower in Block Group (Group I). Highly significant result ($p < 0.0001$). Higher percentage of Non-Block Group and (Group II) patients received morphine. Statistically significant difference ($p = 0.003$) Heart Rate of Block Group showed better stability .Non-block Group had more variability. No statistically significant difference in heart rate trends (NS), despite visible pattern differences. mean arterial pressure is More fluctuations in the Non-block Group. Statistically significant differences ($p < 0.05$) at multiple time points. SBP (Systolic Blood Pressure): More stable in the Block Group. Statistically significant ($p < 0.001$). Diastolic Blood Pressure shows Significant drop observed only in the Non-block Group.Highly statistically significant ($p < 0.001$). Extubation Time is Significantly shorter in Block Group (Group I). Mean ± SD indicates better outcomes.Highly statistically significant ($p < 0.0001$). Group 2 patients reported significantly more pain in the sternum region compared to Group 1 patients. The p-value of 0.011 is less than the significance threshold of 0.05, indicating that this difference is statistically significant. Patients in Group 2 reported significantly higher pain scores in the leg region compared to Group 1. The p-value for this comparison was 0.01, which is less than 0.05, indicating a statistically significant difference in pain perception between the two groups. Group 2 patients need more dexmedetomidine dose after extubation compare to Group1 patients.($p<0.05$)so satistically significant

CONCLUSION:

In conclusion, regional anesthesia can be considered an essential component of multimodal analgesia strategies, providing significant benefits in reducing opioid consumption, enhancing recovery, and stabilizing hemodynamics in cardiac surgery patients. The findings suggest that block patients experience better outcomes, highlighting the importance of personalized anesthetic care tailored to the needs of the patient. Further studies with larger sample sizes are recommended to explore the subtle differences in heart rate dynamics and other hemodynamic parameters across different surgical and anesthetic techniques

INTRODUCTION

INTRODUCTION

Cardiac surgery is a complex and painful procedure that requires effective pain management to optimize patient outcomes. Multimodal analgesia strategies have gained popularity in recent years as a way to provide effective pain relief while minimizing opioid-related side effects.Multimodal analgesia involves combining different analgesic agents and techniques to target multiple pain pathways, reducing the reliance on opioids and improving patient comfort. This approach can include:Regional anesthesia techniques (e.g., nerve blocks)Non-opioid analgesics (e.g., NSAIDs, acetaminophen) Opioids (used judiciously)Adjuvant therapies (e.g., gabapentinoids)

By using a multimodal approach, healthcare providers can: Enhance pain controlReduce opioid consumption Decrease opioid-related adverse effectsImprove patient satisfaction and outcomes Postoperative pain following cardiac surgery is often intense and can significantly impact patient recovery, respiratory function, mobilization, and overall outcomes. Traditionally, opioid-based analgesia has been the cornerstone of postoperative pain control in cardiac surgery. However, reliance on opioids is associated with various side effects including respiratory depression, nausea, vomiting, ileus, pruritus, sedation, and a growing concern over opioid dependence and tolerance.Multimodal analgesia (MMA) has emerged as an effective strategy. MMA refers to the use of two or more analgesic medications or techniques with different mechanisms of action to provide synergistic pain relief while minimizing the required dose of any single agent, particularly opioids. This approach not only improves pain control but also reduces opioid-related side effects and enhances patient satisfaction.In the context of cardiac surgery, multimodal analgesia may include systemic agents such as acetaminophen, NSAIDs, gabapentinoids, and dexmedetomidine, along with regional techniques like thoracic epidural, paravertebral, and erector spinae plane blocks.

These strategies align with Enhanced Recovery After Surgery (ERAS) protocols and contribute to faster extubation, improved pulmonary mechanics, early mobilization, and reduced ICU and hospital stays.

While systemic medications form the backbone of MMA, regional anesthesia plays a critical role in enhancing pain control after cardiac surgery. Techniques like thoracic epidural anesthesia (TEA) have been widely used for decades. However, due to concerns regarding anticoagulation and potential complications, newer alternatives such as ultrasound-guided paravertebral block (PVB) and erector spinae plane (ESP) block are gaining popularity. Paravertebral Block (PVB): Provides unilateral somatic and sympathetic nerve blockade and is associated with lower opioid use, better respiratory outcomes, and fewer side effects.

Erector Spinae Plane (ESP) Block: A safer, less invasive technique that provides effective multi-dermatomal analgesia and is easier to perform under ultrasound guidance.These blocks can be used preoperatively or intraoperatively and may be supplemented with catheter infusions for prolonged postoperative analgesia. Although multimodal analgesia offers numerous benefits, several considerations must be addressed: Drug interactions and patient-specific contraindications (renal/liver function, bleeding risk) Monitoring for toxicity with agents like lidocaine or ketamine .With the rising awareness of opioid-related risks and the need for better perioperative care, it is essential to evaluate and implement effective multimodal analgesia strategies tailored to the needs of cardiac surgery patients. This project aims to explore current practices, review the literature on effective combinations, and highlight safe and effective protocols that can improve outcomes and reduce opioid dependence in the postoperative period. The Pecto-Intercostal Fascial Block (PIFB) is a relatively new ultrasound-guided regional anesthesia technique used for postoperative analgesia, especially after cardiac surgery involving median sternotomy.

The Transversus Thoracic Muscle Plane Block (TTMPB) is an ultrasound-guided regional anesthesia technique designed to provide analgesia to the anterior chest wall, particularly the sternal region. It is especially beneficial for patients undergoing median sternotomy, such as in cardiac surgeries, and serves as a valuable component of multimodal analgesia protocols. The Paravertebral Block (PVB) is a regional anesthesia technique that involves injecting a local anesthetic near the spinal nerves as they emerge from the intervertebral foramina, in the paravertebral space. It is particularly useful for thoracic, abdominal, and cardiac surgeries.

AIM & OBJECTIVE

AIM &OBJECTIVE

AIM:

The aim of this study is to evaluate and optimize multimodal analgesia strategies for postoperative pain management in patients undergoing cardiac surgery. The project seeks to determine the effectiveness of combining regional and systemic analgesics in reducing opioid consumption, enhancing pain control, minimizing side effects, and improving recovery outcomes for cardiac surgery patients.

OBJECTIVES:

1. To assess the efficacy of multimodal analgesia strategies in reducing postoperative pain intensity and opioid consumption in cardiac surgery patients.

2. To evaluate the impact of multimodal analgesia strategies on postoperative recovery, including length of stay in ICU, complications, and patient satisfaction.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

1**. J. Cardiothorac. Vasc. Anesth. (2020)**, Intraoperative Methadone Is Associated with Decreased Perioperative Opioid Use Without Adverse Events. In this study,104 patients who underwent cardiac surgery and received intraoperative methadone.104 matched controls who underwent cardiac surgery but did not receive intraoperative methadone Methadone was administered intraoperatively at a dose of 0.1-0.2mg/kg .The dose was determined by the anesthesiologist based on the patient's weight and clinical factors Descriptive statistics were used to summarize demographic and clinical characteristics Wilcoxon rank-sum tests were used to compare continuous variables between the methadone and control groups Chi-squared tests were used to compare categorical variables between the two groups.

2**. J. Clin. Anesth. (2017),** . The effect of tramadol plus paracetamol on consumption of morphine after coronaryartery bypass grafting. In this study60 patients undergoing coronary artery bypass grafting (CABG) surgery Patients were randomly assigned to one of two groups:Group 1: Tramadol (100 mg) plus paracetamol (1000 mg) administered orally 1 hour before surgery. Group 2: Placebo administered orally 1 hour before surgery Intraoperative and postoperative pain scores (VAS).Morphin consumption in the post-anesthesia care unit (PACU) and on the first postoperative day Adverse events (nausea, vomiting, respiratory depression). Independent samples t-test was used to compare continuous variables between the two groups Based on a previous study, a sample size of 60 patients was calculated to detect a 30% reduction in morphine consumption with a power of 80% and an alpha error of 0.05. The study was conducted over a period of 6 months.

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3. **M.;Leibowitz, A.B.(2015)**, Impact of Intravenous Acetaminophen on Perioperative Opioid Utilization and Outcomes in Open Colectomies In this study nearly13,357 patients undergoing open colectomy surgery between 2010 and 2015 Intravenous acetaminophen (IV APAP) administration during the perioperative period Patients who did not receive IV APAP during the perioperative period Descriptive statistics were used to summarize demographic and clinical characteristics Propensity score matching was used to match patients who received IV APAP with those who did not Multivariable regression analysis was used to evaluate the association between IV APAP administration and perioperative opioid utilization and outcomes were noted as this was a retrospective study using existing data .

4**. Morin, J.E.; Burke(2022**), High dose fentanyl anaesthesia with oxygen for aortocoronary bypass surgery In this study 20 patients undergoing aorto-coronary bypass surgery the Anesthetic Technique used is High-dose fentanyl anesthesia with oxygen .Fentanyl dosage: 50-100 μg/kg Oxygen administration: 100% oxygen via a face mask. The Monitoring areInvasive blood pressure monitoring, Electrocardiogram (ECG),Oxygen saturation monitoring ,Hemodynamic variables (blood pressure, heart rate),Respiratory variables (oxygen saturation, respiratory rate) Anesthetic variables (fentanyl dosage, oxygen administration) Descriptive statistics were used to summarize hemodynamic and respiratory variables No statistical comparisons were made between groups, as this was a prospective, observational studyThe study was conducted over a period of several months.

5. **J. Cardiothorac. Vasc. Anesth.(2023**),Comparison of Opioid-Basedand Multimodal Analgesic Regimens in Adult Cardiac Surgery. In this study1,144 adult patients undergoing cardiac surgery between 2018 and 2020Analgesic Regimens Opioid-based regimen: fentanyl or hydromorphone-based analgesia Multimodal regimen: combination of non-opioid analgesics (acetaminophen, NSAIDs), gabapentinoids, and regional anesthesia (thoracic epidural analgesia). Descriptive statistics were used to summarize demographic and surgical characteristics Univariate and multivariate regression analyses were used to compare outcomes between the opioid-based and multimodal analgesic

DRUG PHARMACOLOGY

FENTANYL: Fentanyl is a synthetic opioid analgesic that works by binding to opioid receptors in the brain and spinal cord. Its mechanism of action involves :Mu-opioid receptor agonism: Fentanyl binds to mu-opioid receptors, activating them and producing analgesia (pain relief), euphoria, and respiratory depression. Inhibition of pain transmission: Fentanyl reduces the transmission of pain signals to the brain, providing pain relief.Release of neurotransmitters: Fentanyl increases the release of neurotransmitters like dopamine, contributing to its euphoric effects.

Indication:

1. Pain management
2. Anesthesia

Contraindication:

1. Opioid-naive patients

2. Respiratory depression

3. Acute or postoperative pain

4. Hypersensitivity

Doses by Clinical Use:

1. Premedication (IV) : 1–2 mcg/kg

2.Induction of anesthesia : 2–5 mcg/kg (up to 10 mcg/kg for cardiac)

3.Maintenance during surgery : 0.5–2 mcg/kg/MAP (infusion or bolus)

4.High-dose cardiac anesthesia : 20–50 mcg/kg (e.g. for CABG)

5.Postoperative pain control (IV) : 25–100 mcg IV bolus, repeated PRN

6. Epidural (preservative-free) : 50–100 mcg (combined with bupivacaine)

MORPHINE: Morphine is a natural opioid analgesic that works primarily by binding to opioid receptors in the central and peripheral nervous systems.Binds to μ-opioid receptors on neurons in the brain, spinal cord, and gastrointestinal tract. Inhibits adenylate cyclase activity, reducing intracellular cAMP. Opens potassium channels → leads to hyperpolarization of neurons. Closes calcium channels → inhibits neurotransmitter release (like substance P, glutamate). Reduced pain transmission and perception**.**

Contraindications:

1. Known hypersensitivity to fentanyl or other opioids
2. Severe respiratory depression without resuscitative equipment
3. Acute or severe bronchial asthma in unmonitored settings
4. Paralytic ileus (risk of worsening bowel function)

Indication:

1.Postoperative pain

2. Trauma or injury

3. Burns

4. Myocardial infarction (MI)

5.CMA Ponic pain (especially cancer-related or palliative care)

6. Reduces preload and afterload

7.Decreases dyspnea and anxiety

Dose:

1.Initial dose: 2.5–5 mg IV slowly over 4–5 minutes

2.Titrated dose (e.g. in ICU, PACU): 1–2 mg IV every 5–10 minutes as needed

3. Max single dose: Usually up to 10 mg (depending on patient site and setting)

4. Weight-based dose (e.g., cardiac anesthesia): 0.1 mg/kg IV

DEXMEDETOMIDINE:Dexmedetomidine is a highly selective α2-adrenergic receptor agonist, used for sedation, analgesia, and anxiolysis, especially in ICU and perioperative setting .Acts on α2 receptors in the locus coeruleus of the brainstem : Inhibits norepinepherine release and Produces sedation and anxiolysis, Spinal cord α2 receptors Reduces substance P release Provides analgesia

Indication:

1. ICU Sedation- Sedation of intubated and mechanically ventilated patients in intensive care units (ICU)

2. Procedural Sedation

3. Perioperative Sedation (OR use)

Contraindications :

1. Known hypersensitivity to dexmedetomidine or its components
2. Severe bradycardia or heart block (especially without a pacemaker)
3. Severe hypotension or shock (risk of further BP drop)
4. Advanced heart block (2nd or 3rd degree without pacemaker)
5. Severe liver impairment (due to hepatic metabolism) – use with caution
6. Caution in elderly, renal impairment, and pregnancy (safety not established)

DOSE:

ICU Sedation:

- Loading dose (optional):

  1 mcg/kg over 10 minutes

- Maintenance infusion:

  0.2 to 0.7 mcg/kg/MAP IV

Procedural Sedation / Short Surgeries:

- Loading dose:

  1 mcg/kg over 10 minutes

- Maintenance infusion:

  0.2–1 mcg/kg/MAP

MATERIAL AND METHODS

MATERIALS AND METHOD

STUDY DESIGN: Prospective, randomized controlled trial (RCT): Cardiac surgery patients will be randomly assigned to receive either a multimodal analgesia strategy or a traditional opioid-based analgesia regimen.

SAMPLE SIZE: Based on the previous study as reference the sample size is100 patients for each group.
Group1-patient receiving block
Group2- patient not receiving block

DURATION: 6 months

MATERIALS REQUIREMENT:

1. IV access with 20G,18G,16G Venflon
2. IV set ,stimuplex needle, probe cover ,strile tray
3. 20cc ,50cc,2cc and 10cc syringes ,normal saline, tinchure, gauzepack
4. Syringe pump ,Pressure monitoring line
5. Ultrasound

6. **Drugs:**
I.Fentanyl
II. Morphine
III. Dexmedetomidine

IV. Ropivacaine0.2%

V. Ropivacaine0.725%

VI. Bupivacaine0.25%

Haemodynamic parameters

Total opioid dose usage intraoperatively.

Total dose of local drug

INCLUSION CRITERIA:

1. Adult cardiac surgery patients undergoing coronary artery bypass grafting (CABG),
2. valve repair or replacement
3. other cardiac surgical procedures.

EXCLUSION CRITERIA:

1. Patients with a history of opioid addiction
2. Patient with history of cMA Ponic pain,
3. Patient with history of allergy to study medications.

METHODOLOGY:

Patient, were assesed in preoperative room. On Arrival in the operation theatre monitors were Attached (MAP, NIBP, oxygen saturation, ECG, EtCO2) and RECEIVAL vital parameters like heart rate, Systolic and diastolic blood pressure and oxygen Saturation was recorded .Inj .Midazolam 1mgto1.5mg\kg was given for amnesia Injection fentanyl 5to15µg/kg was given for analgesia. Anaesthesia was induced with intravenous propofol 2mg/kg and inj. rocuronium 1to 1.5 mg\kg and inj .vecuronium 0.1 to 0.25 mg\kg was Used to facilitate tracheal intubation. Anaesthesia Was maintained by oxygen, nitrous oxide (50:50), sevoflurane pressure control ventilation (PCV) Was delivered with tidal volume and respiratory rate Adjusted to maintain end tidal carbon dioxide between 35-45 mmHg. Intravenous inj .dexmedetomidine 0.2,0.4,0.6 mcg\kg\MAP inserted in syringe pump in 50cc syringe for sedation . In regional anesthesia the erector spinae plane block (ESPB), serratus anterior muscle plane block (SAPB), pectoral muscle blocks (PECS I and PECS II), transversus thoracis muscle plane block (TTMB), and pecto-intercostal fascial plane block (PIFB), parasternal intercostal plane (PIP) blocks are given by using guide wire, stimuplex needle 100mm, probe cover, by using drugs ropivacaine 0.2%, bupivacaine 0.5%,bupivacaine 0.25%.adjuvant used are inj.dexamethasone4mg\ml,and.dexmedetomidine100mcg\ml. Patient were extubated and sedation maintained with inj. dexmedetomidine. the drug was slowly decreased based on patient pain score. inj. Fentanyl, inj. morphine were given if necessary by order of anesthesiologist.

SAMPLING TECHNIQUE:

All adult patients undergoing cardiac surgery under endo- tracheal intubation with ASA 3&4 will be
included.

STUDY VARIABLES:

Variables include:

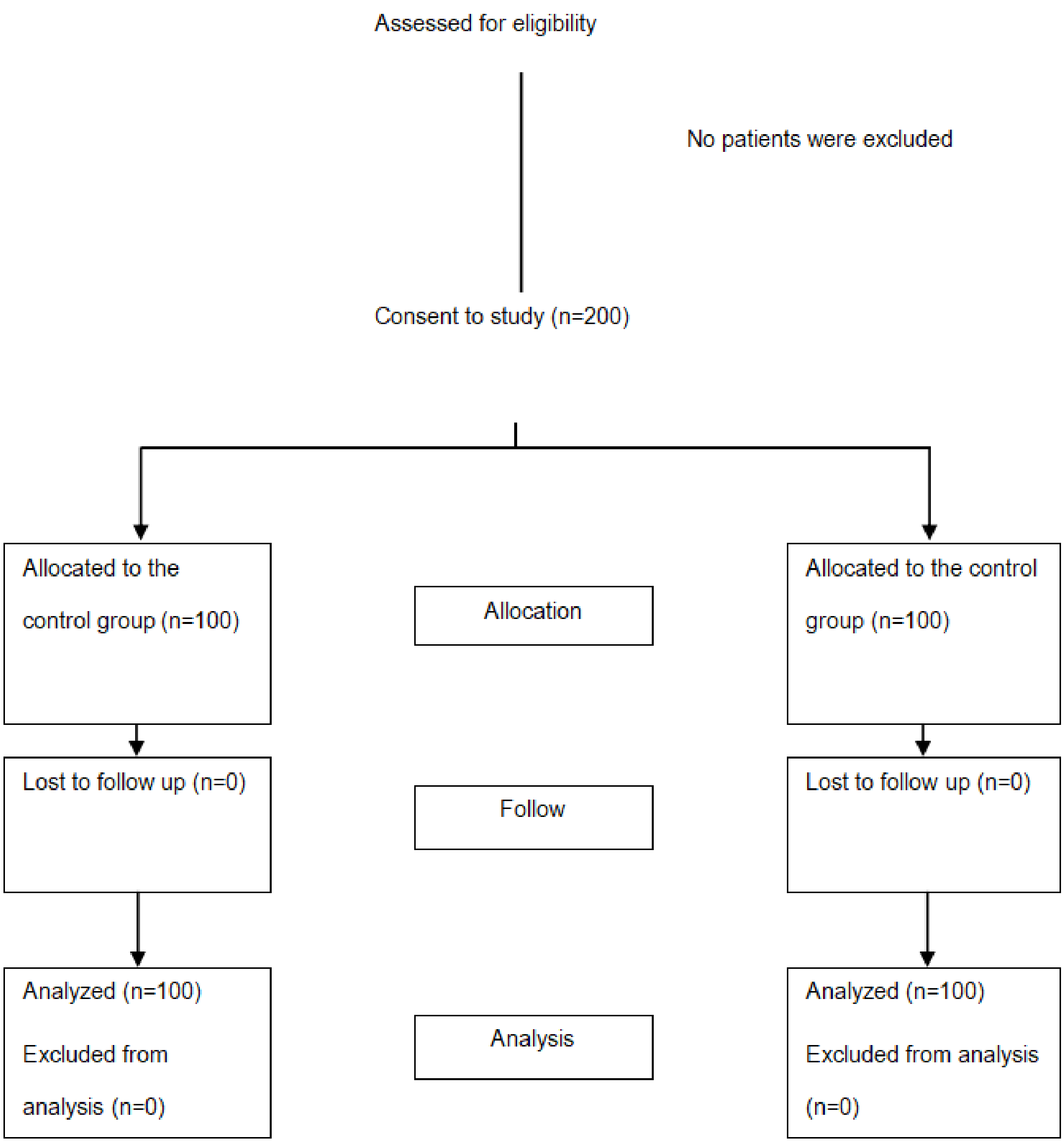
- Name
- Age
- Height and weight
- Hemodynamic parameters in intraoperative
- Dose of morphine and fentanyl during induction.
- Vitals after shifting to icu
- Extubation time
- Inj. Dexmedetomidine dose
- Pain score after extubation

STATISTICAL ANALYSIS

DATA ENTRY AND ANALYSIS:

Data were entered in Microsoft excel. The results were presented with mean, standard deviation and p value. Categorical data were expressed and compared using Chi- squared test. Chi square test were done to compare categorical variables like HR, SBP, DBP,MAP and PAIN SCORE,OPOID DOSE.

FIGURE 1: METHOD OF DATA COLLECTING:



RESULTS

RESULTS

TABLE 1: DEMOGRAPHIC PROFILE OF BOTH GROUP PATIENTS

VARIABLES	GROUPS		P VALUE
	GROUP1 BLOCK	GROUP2 NON BLOCK	
Age	56.94 ±14.14	59.53± 12.35	0.047
Weight	69.85 ± 12.93	71.83 ± 12.16	0.332
Height	157.6± 8.05	164.06 ± 8.16	0.248

Demographic characteristics including age , weight ,height were comparable between the two groups ,with no statistically significant differences observed Age shows a statistically significant difference (p = 0.047). Weight and Height differences are not statistically significant (p > 0.05).

GRAPH 1: DEMOGRAPHIC DATA OF BOTH GROUP OF PATIENTS

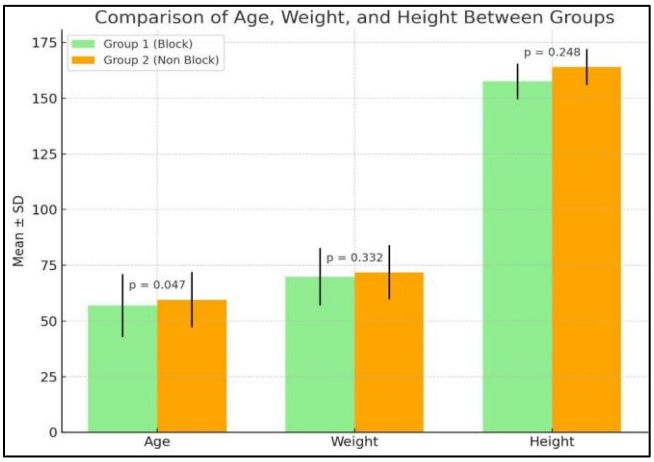


TABLE 2: USE OF INTRAOPERATIVE FENTANYL

FENTANYL DOSE(MCG)	GROUP I BLOCK	GROUP 2 NON-BLOCK	p value
MEAN ± SD	371.15±248.35	932.35±215.47	<0.0001 Significant

The ststistical Fentanyl use between Group I (Block) and Group II (Non- Block), showing mean ± SD. The result indicates a significantly lower fentanyl dose in the block group Patients. ($p < 0.0001$).

GRAPH 2: USE OF INTRAOPERATIVE FENTANYL

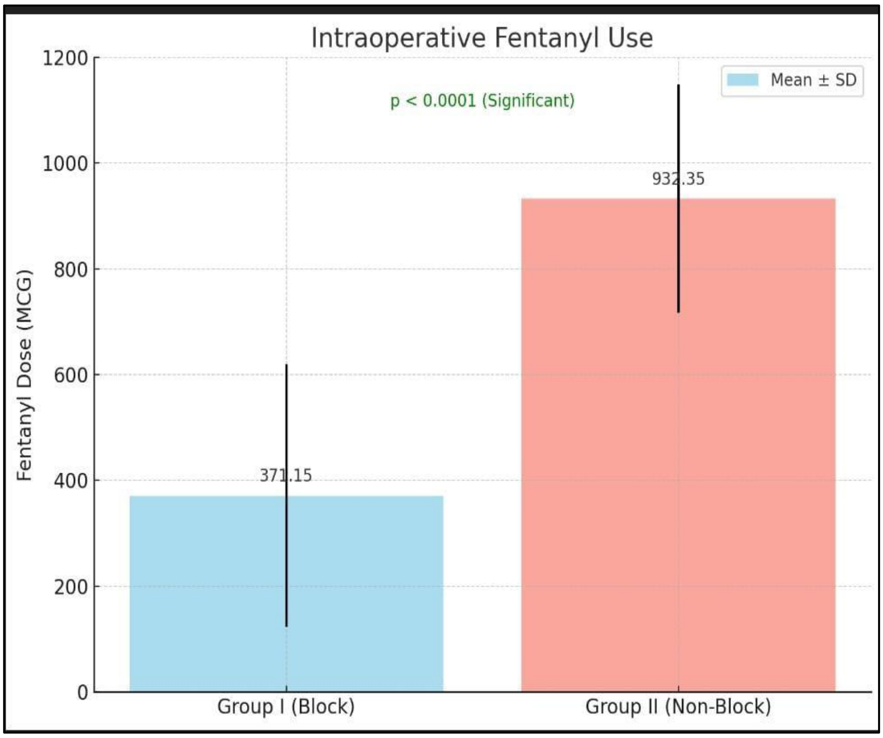


TABLE 3 :USE OF INTRAOPERATIVE MOPHINE

MORPHINE DOSE	**GROUP 1 BLOCK**	**GROUP 2 NONBLOCK**	**Pvalue**
YES	20(10%)	40(20%)	0.003 Significant
NO	80(40%)	60(30%)	
MEAN ± SD	5.0±7.5	8.0± 6.0	

This statistical analyse shows higher percentage of patients in Non block group received morphine .the difference is statistically significant (p=0.003).

GRAPH 3: USE OF INTRAOPERATIVE MOPHINE

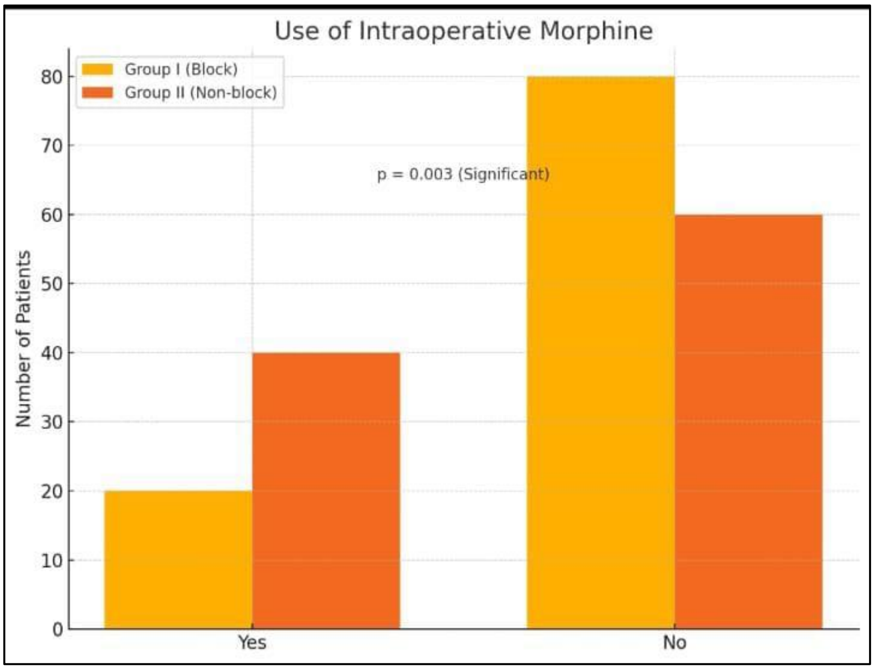


TABLE 4: HEART RATE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS:

GROUPS	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP 1 BLOCK PATIENTS	BASLINE -INDUCTION	0.34	15.63	0.828
	BASLINE -INCISION	2.97	9.41	0.0003
	BASLINE-STERNOTOMY	4.16	13.28	0.00227
	BASLINE-60MIN	1.03	16.13	0.525
	BASELINE-120MIN	3.6082	15.1311	0.0209
	BASLINE – POSTPUMP	1.0700	17.3102	0.5379
	BASLINE – SHIFTING TO ICU	6.7800	16.887	0.0000
GROUP 2 NON BLOCK PATIENTS	BASLINE -INDUCTION	8.4762	12.4244	0.002
	BASLINE -INSCISION	3.841	14.6892	0.0011
	BASLINE STERNOTOMY	1.5397	15.8387	0.3066

	BASLINE - 60 MIN	0.1667	12.3824	0.8572
	BASLINE -120MINS	12.1587	10.6847	0.000
	BASLINE – POST PUMP	9.3810	18.0682	0.001
	RECEIVAL-SHIFTING TO ICU	0.8095	14.3443	0.3939

statistical analyse shows that block patient demonstrate better heart rate stability over time. Non block patient more pronounced MAP fluctuation. Statistically significant changes ($p<0.05$) occurred more frequently in non block group patients

GRAPH: 4 : HEART RATE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS:

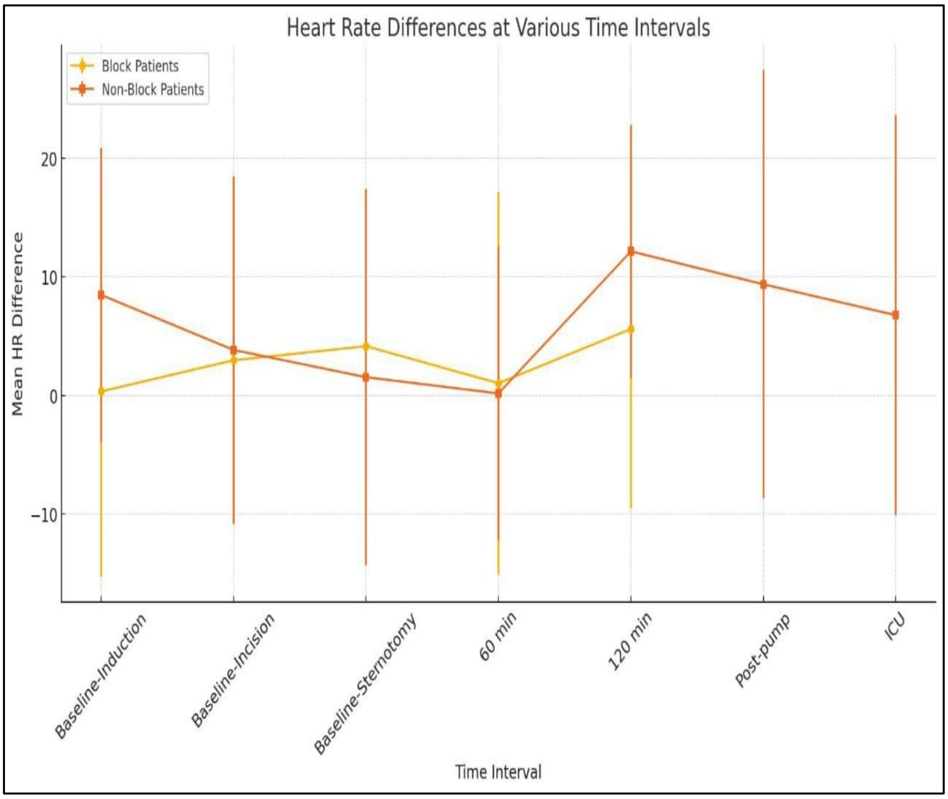


TABLE 5: SYSTOLIC BLOOD PRESSURE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS:

GROUPS	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP1 BLOCK PATIENTS	BASLINE -INDUCTION	-24.1765	35.7827	0.001
	BASLINE - INCISION	-38.0118	32.7828	0.002
	BASLINE - STERNOTOMY	-30.4000	31.8226	0.001
	RECEIVAL -60 MIN	-43.3412	33.9134	0.006
	RECEIVAL - 120 MIN	-39.4471	32.2409	0.003
	BASLINE -POSTPUMP	-49.4471	35.2409	0.002
	BASLINE-SHIFTINGTO ICU	-28.2353	35.4836	0.001
GROUP 2 NON BLOCK PATIENTS	BASLINE -INDUCTION	-26.0714	22.8175	0.0003
	BASLINE -INSCISION	-36.0000	26.0847	0.0002

	BASLINE- 60 MIN	-35.0000	23.4733	0.0003
	BASLINE - 120 MINS	-31.0794	26.6531	0.0002
	BASLINE – POST PUMP	-45.2222	30.4286	0.0004
	RECEIVAL-SHIFTING TO ICU	35.0000	26.6531	0.0002

In this statistical analyse showed highly significant changes in SBP with $p<0.001$ block patients maintained more stable SBP compared to Non block patients.

GRAPH 5 : SYSTOLIC BLOOD PRESSURE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS

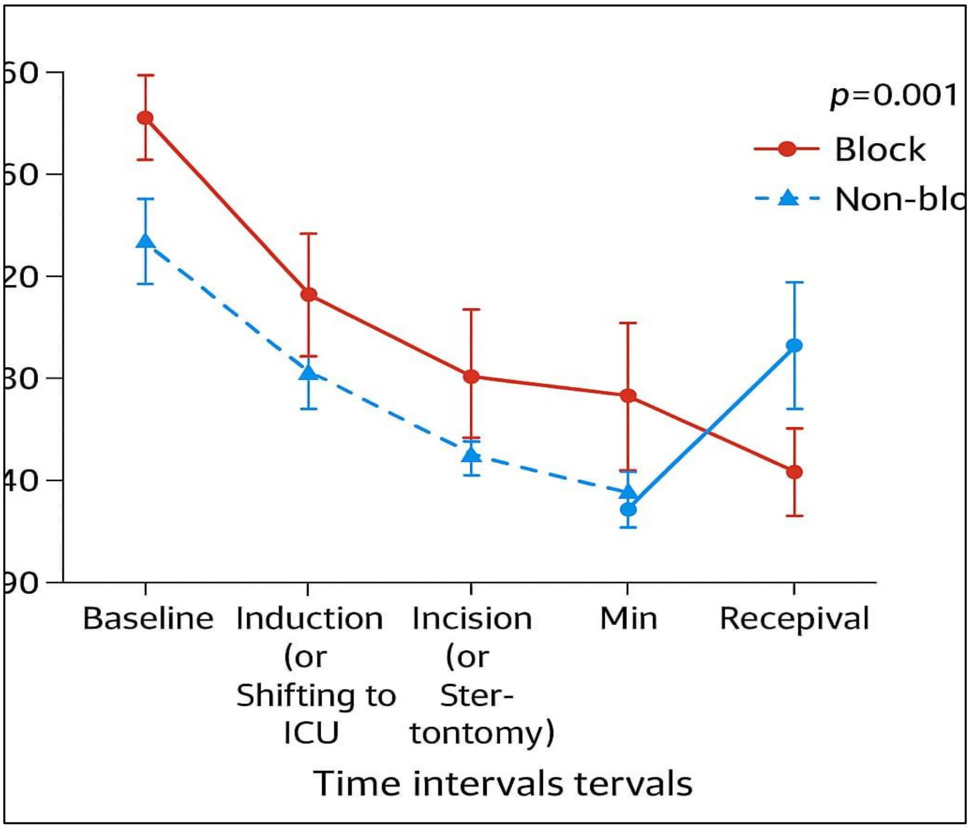


TABLE 6: DIASTOLIC BLOOD PRESSURE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS:

GROUPS	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP 1 BLOCK PATIENTS	BASLINE - INDUCTION	-4.5000	17.5134	0.0001
	BASLINE - INCISION	-13.4000	23.3891	0.0003
	BASLINE- STERNOTOMY	-10.4706	20.0241	0.0005
	RECEIVAL -60MIN	-18.1471	20.4498	0.0002
	BASE LINE -120 MIN	-17.2727	20.9645	0.0002
	BASLINE – POST PUMP	1.06	9.304	0.517
	BASLINE – SHIFTING TO ICU	10.52	10.028	<0.001*
GROUP 2 NON BLOCK PATIENTS	BASLINE - INDUCTION	0.0500	20.0187	0.9610
	BASLINE - INSCISION	-13.5833	21.5461	0.0003

	BASLINE - STERNOTOMY	-12.5667	17.7428	0.0001
	BASLINE- 60 MIN	-17.5000	18.5742	0.0003
	BASLINE SPB - 120 MINS	-11.2667	17.3977	0.0004
	BASLINE DBP – POST PUMP DBP	-16.0333	19.4966	0.0001
	RECEIVAL DBP- SHIFTING TO ICU DBP	-12.5667	17.76	0.0001

The statistical analyse shows that statistically significant only in Non block group (p<0.001).The non block group shows larger DBP drop.

GRAPH6 :DIASTOLIC BLOOD PRESSURE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS

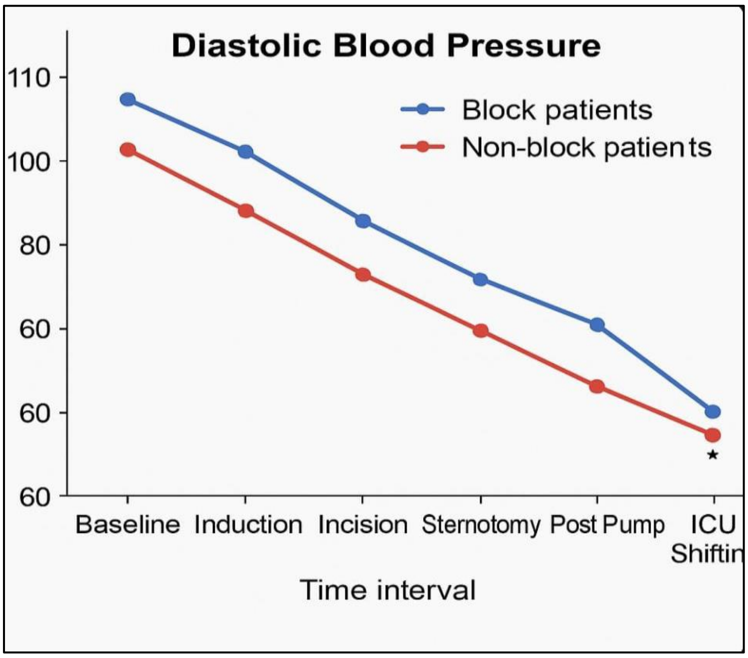


TABLE 7 : MEAN ARTERIAL PRESSURE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS:

GROUPS	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP 1 BLOCK PATIENTS	BASLINE - INDUCTION	-17.5000	20.1537	0.0004
	BASLINE - INCISION	-24.5714	23.6361	0.0003
	BASLINE- STERNOTOMY	-20.0000	22.7595	0.0000
	BASLINE – 60MIN	-26.5571	21.9715	0.0002
	BASLINE – 120MIN	-29.2143	23.4901	0.0004
	BASLINE–POST PUMP	-28.5714	24.4486	0.0003
	BASLINE – SHIFTING TO ICU	23.4194	20.1188	0.0005
GROUP 2 NON BLOCK PATIENTS	BASLINE - INDUCTION	-18.0968	17.9827	0.0002
	BASLINE - INSCISION	-23.4194	19.5184	0.0001

	BASLINE - STERNOTOMY	-23.1290	20.1188	0.0005
	BASLINE 60 MIN	-27.9516	18.3449	0.0002
	BASLINE - 120 MINS	-30.8710	19.4908	0.0001
	BASLINE – POST PUMP	-24.5484	22.3933	0.0002
	RECEIVAL-SHIFTING TO ICU	-23.4194	20.5184	0.0001

In this analyse shows that All the reported($p< 0.05$), indicating that the mean differences observed at each time interval for both groups are statistically significant.

GRAPH 8 : MEAN ARTERIAL PRESSURE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS:

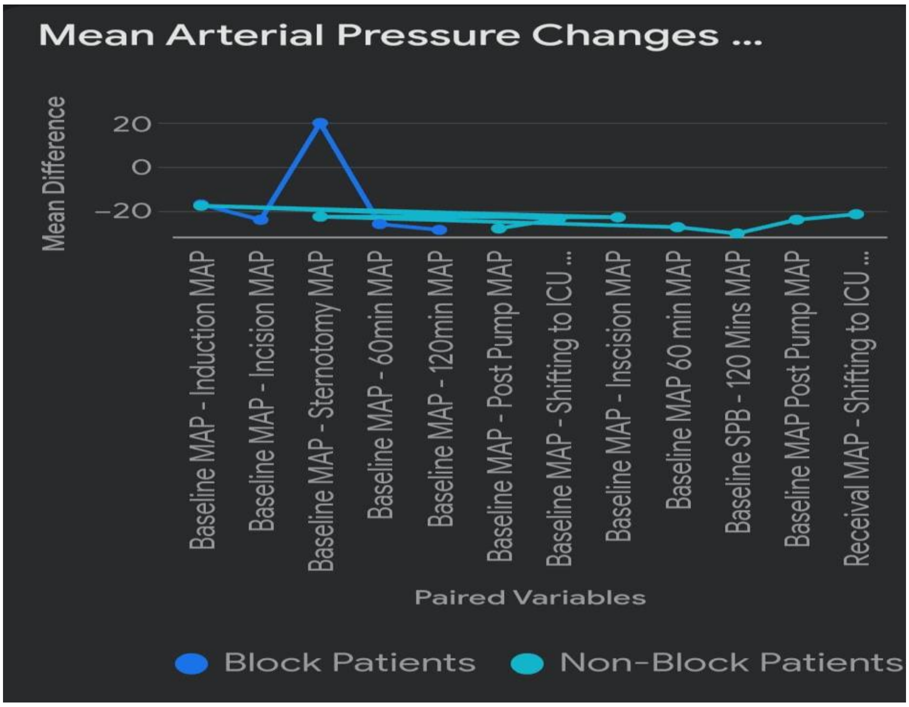


TABLE 8 : COMPARISON OF EXTUBATION TIME:

EXTUBATION TIME(minutes)	**GROUP 1 BLOCK**	**GROUP 2 NON BLOCK**	**p value**
MEAN ± SD	21.94±3.94	15.33±3.94	<0.0001 Significant

The ststistical analyse shows extubation time between Group I (Block) and Group II (Non- Block) patients, showing mean ± SD. The result indicates a significantly extubation time less in the block group Patients. ($p < 0.0001$).

GRAPH 8: COMPARISON OF EXTUBATION TIME:

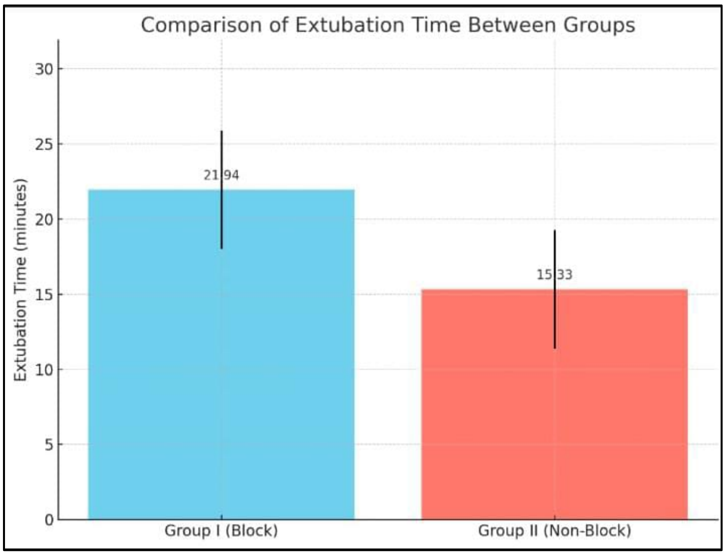


TABLE 9: HEART RATE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU

GROUPS	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP1 BLOCK PATIENTS	RECEIVAL - 1ST HOUR	-1.716	7.317	0.026
	RECEIVAL - 3RD HOUR	-7.182795	13.888	1.148
	RECIVAL - 6TH HOUR	-0.2580	8.38744	0.75040
	RECEIVAL -9TH HOUR	-0.258	8.38	0.750

GROUP	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP2 NON BLOCK PATIENTS	BASLINE - 1ST HOUR	-0.483	1.79	0.000112
	BASLINE - 3RD HOUR	-4.883	5.489	1.39
	BASLINE- 6TH HOUR	3.433	10.34	0.000129
	RECEIVAL-9TH HOUR	0.45	14.170	0.621

Group 2(non block) patients shows a drop in heart rate at the 3rd hour and group 1(block) patients shows peak heart rate in 3rd followed by decline .so no statistically significant shows in heart rate.

GRAPH 9: HEART RATE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU

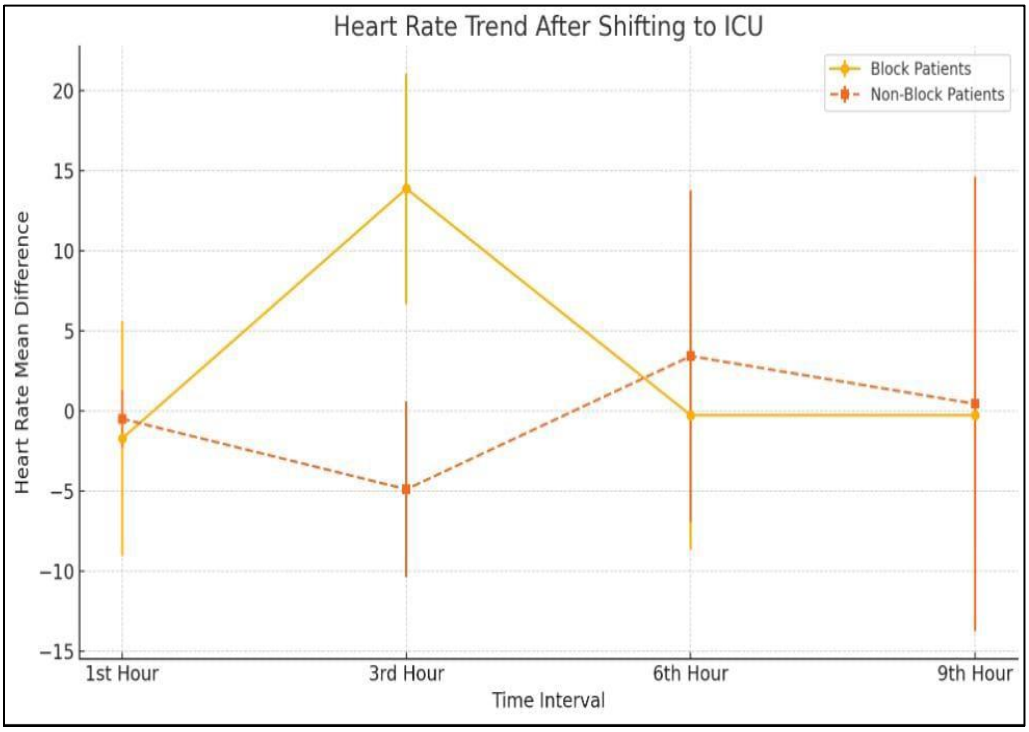


TABLE 10 : SYSTOLIC BLOOD PRESSURE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU

GROUPS	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP1 BLOCK PATIENTS	RECEIVAL SBP - 1^{ST} HOUR SBP	-19.194	14.488	1.89
	RECEIVAL SBP - 3^{RD} HOUR SBP	-13.62	13.886	1.16
	RECIVAL SBP- 6^{TH} HOUR SBP	-22.177	21.489	1.49
	RECEIVAL SBP-9^{TH} HOUR SBP	0.548	15.987	0.730

GROUPS	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP2 NONBLOCK PATIENTS	RECEIVAL SBP - 1^{ST} HOUR SBP	-20.255	11.742	1.12
	RECEIVAL SBP - 3^{RD} HOUR SBP	-16.043	8.239	1.15
	RECIVAL SBP- 6^{TH} HOUR SBP	-24.787	18.875	1.49
	RECEIVAL SBP-9^{TH} HOUR SBP	-10.894	15.290	1.19

Group 1 patients systolic blood pressure slightly recovers at 9th hour Group 2patients systolic blood pressure midly recovers at 9th hour so no statistically significant shows in systolic blood pressure.

GRAPH 10: SYSTOLIC BLOOD PRESSURE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU

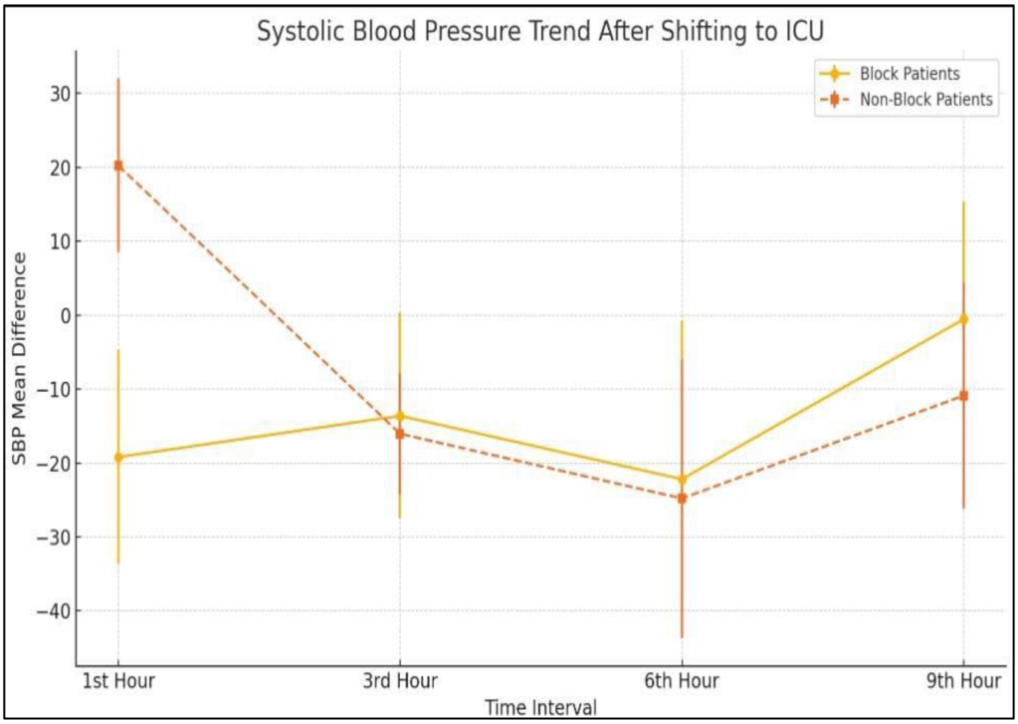


TABLE 11: DIASTOLIC BLOOD PRESSURE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU

GROUPS	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP1 BLOCK PATIENTS	RECEIVAL DBP - 1ST HOUR DBP	-12.143	11.273	1.18
	RECEIVAL DBP - 3RD HOUR DBP	-15.571	16.350	1.49
	RECIVAL DBP- 6TH HOUR DBP	-7.857	29.282	0.00108
	RECEIVAL DBP-9TH HOUR DBP	2.0	17.205	0.311

GROUPS	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP 2 NON BLOCK PATIENTS	RECEIVAL DBP - 1ST HOUR DBP	-11.433	9.052	1.05
	RECEIVAL DBP - 3RD HOUR DBP	-11.33	11.77	3.8
	RECIVAL DBP- 6TH HOUR DBP	-19.167	15.481	1.22
	RECEIVAL DBP-9TH HOUR DBP	-2.1	3.95	1.12

Group 1 patients may have more controlled diastolic blood pressure compare to group 2 patients (p<0.001)so that DBP statistically significant .

GRAPH 11: DIASTOLIC BLOOD PRESSURE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU

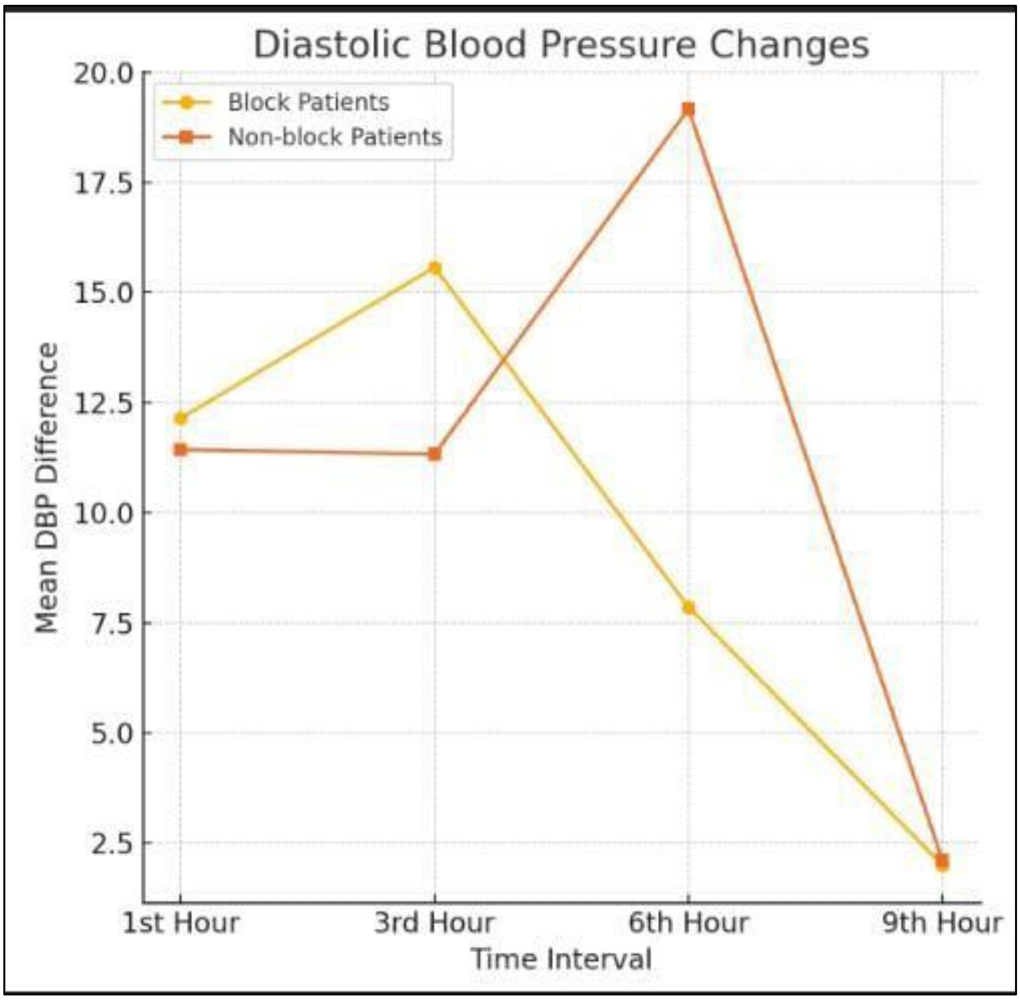


TABLE 12: MEAN ARTERIAL BLOOD PRESSURE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU

GROUPS	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP 1 BLOCK PATIENTS	RECEIVAL MAP - 1ST HOUR MAP	-16.0	12.460	1.12
	RECEIVAL MAP - 3RD HOUR MAP	-16.87	13.75	1.10
	RECIVAL MAP- 6TH HOUR MAP	-15.43	18.12	1.9
	RECEIVAL MAP-9TH HOUR MAP	-4.57	10.129	1.02

GROUPS	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP 2 NON-BLOCK PATIENTS	RECEIVAL MAP - 1ST HOUR MAP	-15.063	9.839	1.12
	RECEIVAL MAP - 3RD HOUR MAP	-9.233	6.088	1.1
	RECIVAL MAP- 6TH HOUR MAP	-16.5	15.036	1.69
	RECEIVAL MAP-9TH HOUR MAP	5.0	9.574	1.45

Group 2 patients and Group 1 patients shows some comparison the p value>0.05 so no statistical significant.

GRAPH 12: MEAN ARTERIAL BLOOD PRESSURE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU

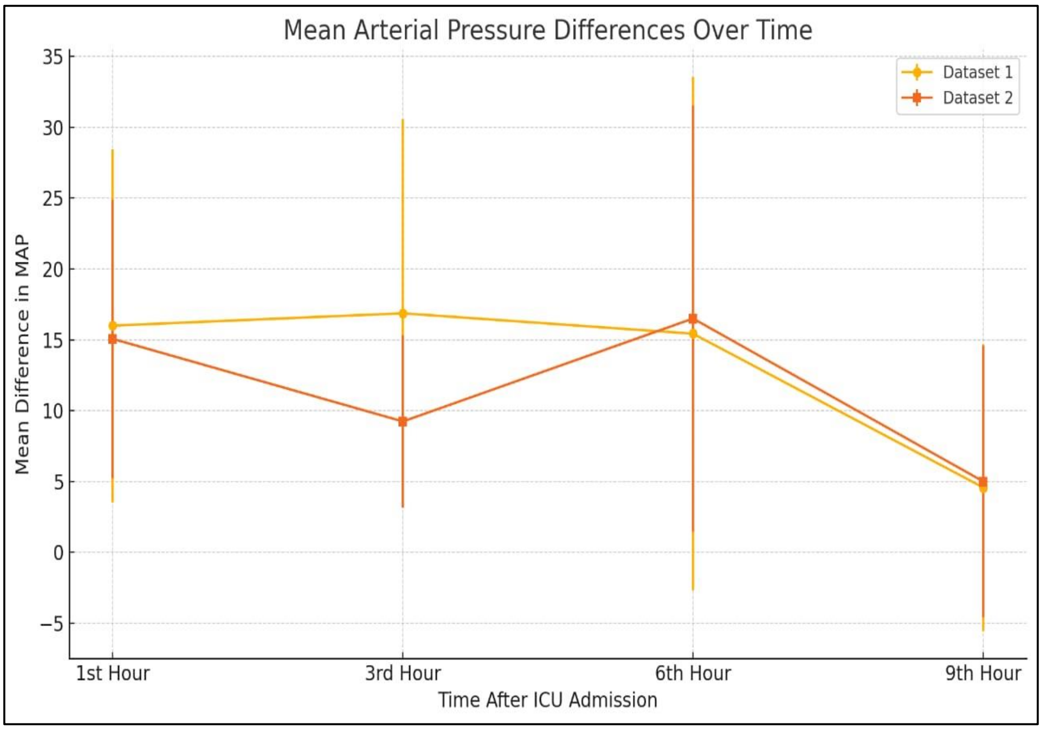


TABLE 13 : PAIN SCORE IN STERNUM REGION OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU

GROUP	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP1 BLOCK PATIENTS	0HOUR TO 8TH HOUR	0	0	**1.0**
	0 HOUR TO 16TH HOUR	1.85	10.84	0.097
	0 HOUR TO 24TH HOUR	0.01	0.10	0.094

GROUP	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP 2 NON	0HOUR TO 8TH HOUR	0.64	0.48	**0.000**
	0 HOUR TO 16TH HOUR	0.03	0.07	0.098

BLOCK PATIENTS	0 HOUR TO 24TH HOUR	1.86	10.72	0.092

Group 2 patients shows more pain in the sternum region compare to Group1 patients .The p value of 0.011is less than 0.05,indicating a statistically significant.

GRAPH 13: PAIN SCORE IN STERNUM REGION OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU

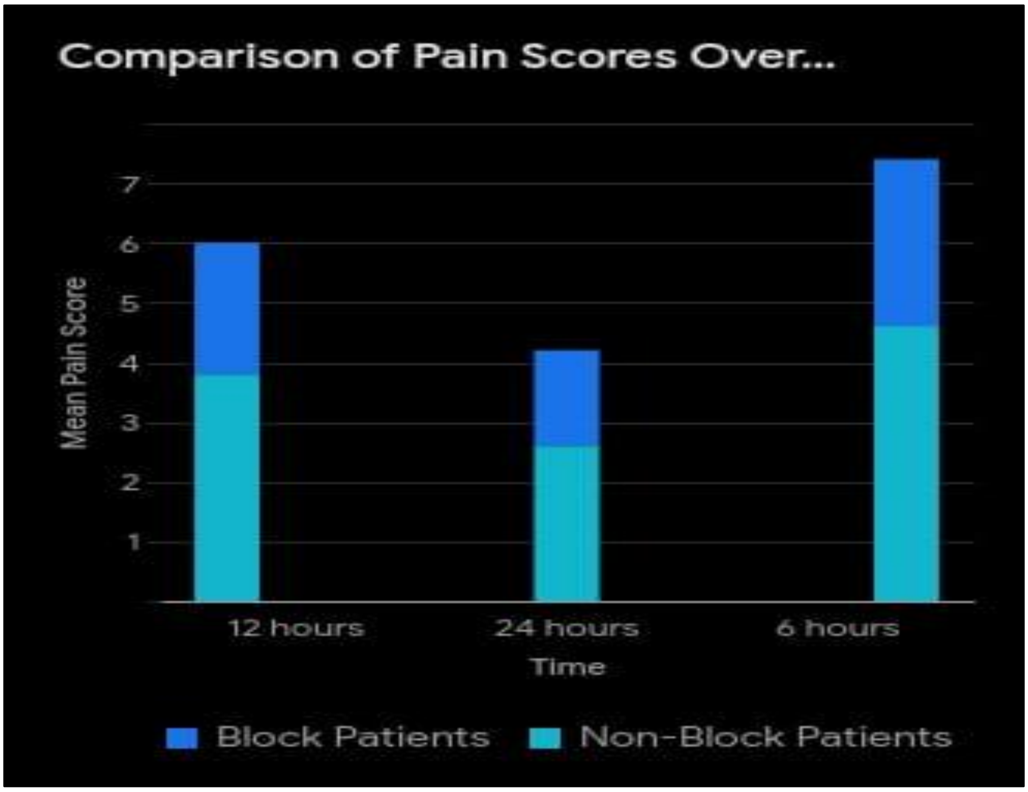


TABLE 14: PAIN SCORE IN LEG REGION OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU

GROUP	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP 1	0HOUR TO 8TH HOUR	0.24	1.80	**0.4**
BLOCK PATIENTS	0 HOUR TO 16TH HOUR	0.06	0.966	0.72
	0 HOUR TO 24TH HOUR	-0.36	1.055	0.056

GROUP	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP 2 NON	0HOUR TO 8TH HOUR	0.75	0.433	**0.1**
	0 HOUR TO 16TH HOUR	1.47	0.50	0.2

BLOCK PATIENTS	0 HOUR TO 24TH HOUR	2.0	2.1	0.011

Group 2 patients shows more pain score in leg region compared to Group1 patients .the p value is0.01 which means(p<0.05) indicating statistically significant.

GRAPH 14: PAIN SCORE IN LEG REGION OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU

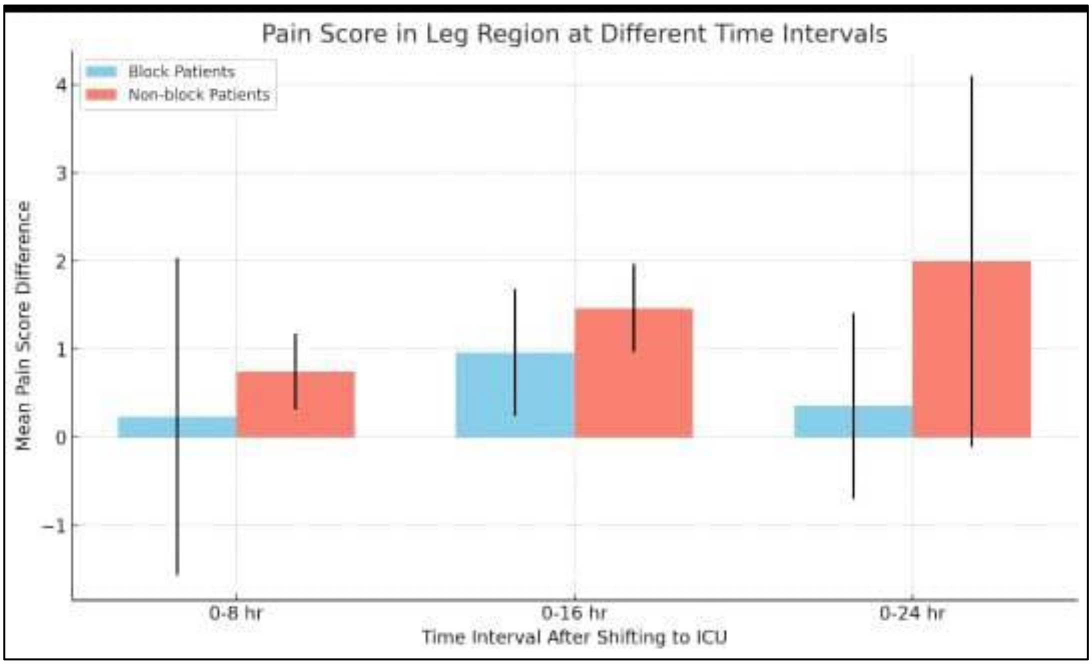


TABLE 15: PAIN SCORE IN DRAIN SITE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU

GROUP	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP 1 BLOCK PATIENTS	0HOUR TO 8TH HOUR	0.85	0.62	**0.40**
	0 HOUR TO 16TH HOUR	0.73	0.81	0.42
	0 HOUR TO 24TH HOUR	0.85	0.66	0.12

GROUP	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP 2 NON BLOCK PATIENTS	0HOUR TO 8TH HOUR	0.66	0.48	**0.93**
	0 HOUR TO 16TH HOUR	0.65	0.50	0.97
	0 HOUR TO 24TH HOUR	1.45	0.48	0.001

Group 1 and Group 2 shows no statistically significant difference over 0 to 8th hour($p>0.05$). in drain site area the mean difference is 1.45 at 24th hour. Satstistically significant rise in pain was seen at 24th hour($p=0.001$).

GRAPH 15: PAIN SCORE IN DRAIN SITE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU

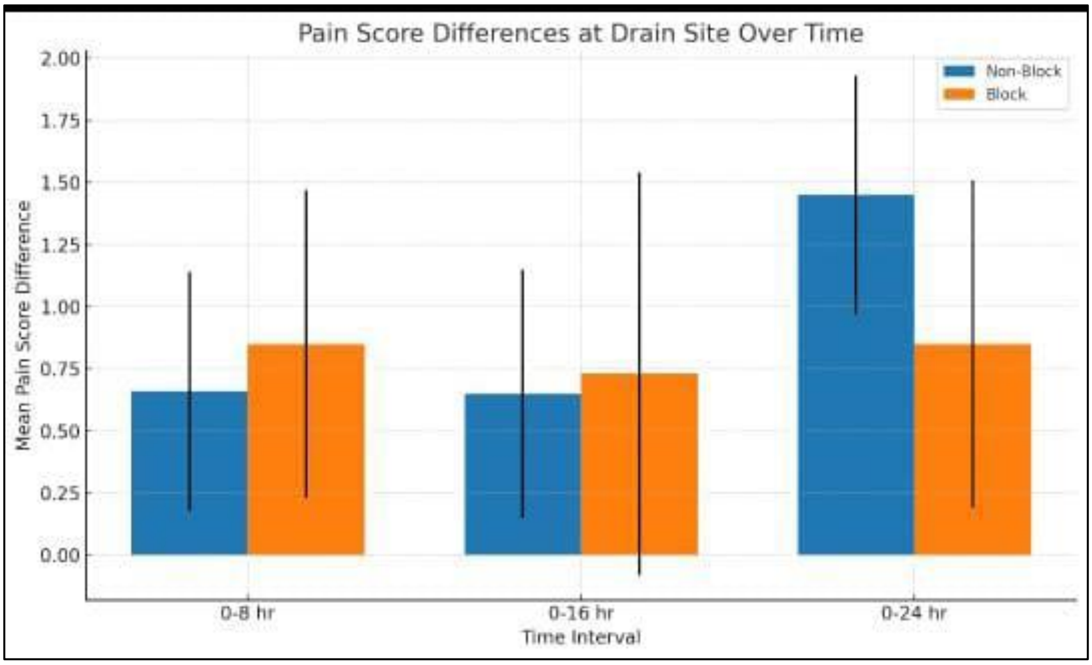


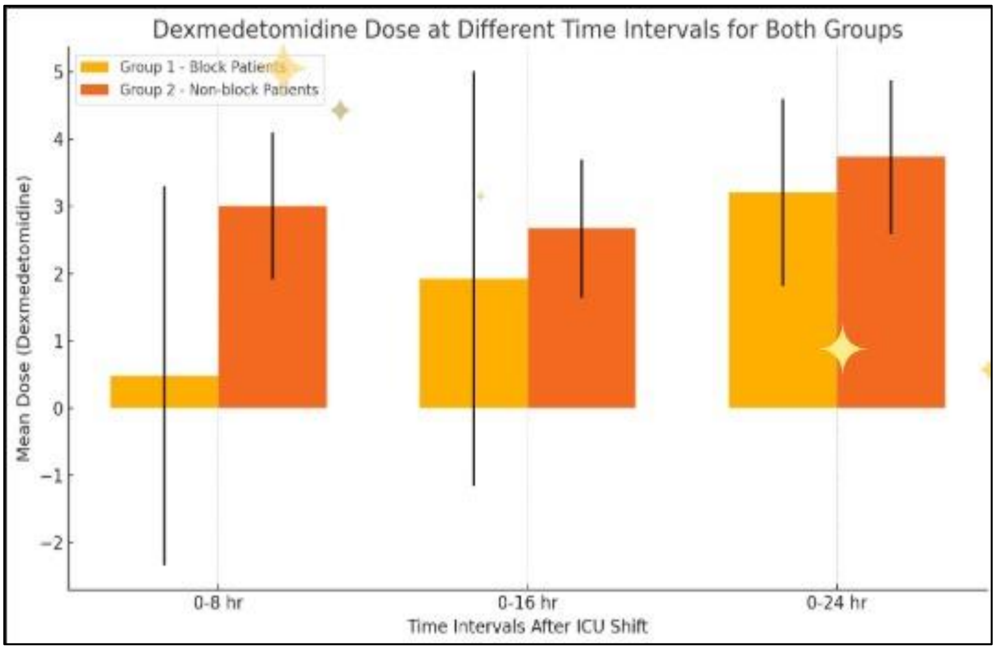
TABLE 16: DEXMEDETOMIDINE DOSE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU

GROUP	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP 1 BLOCK PATIENTS	0HOUR TO 8TH HOUR	0.485	2.817	**0.088**
	0 HOUR TO 16TH HOUR	1.923	3.084	1.11
	0 HOUR TO 24TH HOUR	3.327	3.209	1.389

GROUP	PAIRED VARIABLES	PAIRED DIFFERENCES		P VALUE
		MEAN	SD	
GROUP 2 NON BLOCK PATIENTS	0HOUR TO 8TH HOUR	1.644	3.007	**1.089**
	0 HOUR TO 16TH HOUR	2.006	2.672	1.028
	0 HOUR TO 24TH HOUR	-2.84	3.737	1.141

Group 2 patients need more dexmedetomidine dose after extubation compare to Group1 patients.(p<0.05)so satistically significant

GRAPH 16: DEXMEDOMIDINE DOSE OF BOTH GROUPS AT DIFFERENT TIME INTERVALS AFTER SHIFTING TO ICU



DISCUSSION

DISSCUSION

In this study, we investigated the effect of multimodal analgesia strategies in cardiac surgery, focusing on two patient groups: those who received a regional block (Group 1) and those who did not (Group 2). The results highlight several important findings in terms of pain management, extubation time, and hemodynamic stability. Patients in the block group (Group 1) required significantly less opioid analgesia (morphine), which is consistent with the well-established benefits of regional anesthesia. Regional blocks like ESP (Erector Spinae Plane) block or paravertebral block provide localized pain relief, reducing the need for systemic opioid analgesia, which can have side effects such as nausea, vomiting, and respiratory depression. The significant reduction in morphine use in the block group, as observed in our study, is a key advantage of regional anesthesia.Another crucial finding was that Group 1 (block patients) had a significantly shorter extubation time compared to Group 2 (non-block patients). This finding aligns with other studies that suggest regional blocks can improve recovery times by minimizing pain and promoting faster mobilization. Shorter extubation times contribute to quicker recovery and may reduce the length of ICU stays, leading to better overall patient outcomes. Blood pressure and heart rate trends showed interesting differences. Group 1, who received the block, had more stable blood pressure throughout the surgery. While heart rate exhibited a slight variation in both groups, the difference was not statistically significant. This could indicate that while regional anesthesia provides better control of blood pressure, it may not have the same consistent effect on heart rate dynamics in this patient population. However, the lack of significant differences in heart rate could be attributed to individual patient factors, surgical factors, or the type of block used.Both groups showed fluctuations in heart rate, but Group 2 (non-block patients) showed a drop in heart rate at the third hour post-surgery, while Group 1 showed a peak followed by a decline. This observation could be related to the sympathetic blockade in block patients that may have affected autonomic regulation, whereas the non-block patients may have had less control over their hemodynamic response. However, because the heart rate data did not show a statistically significant difference, it remains an area for further study, possibly involving a larger sample size or different anesthesia protocols.

CONCLUSION

CONCLUSION

In the study underscores the positive impact of regional analgesia techniques on pain management and postoperative recovery in patients undergoing cardiac surgery. While heart rate showed variations between the groups, these differences were not statistically significant. Specifically, patients who received regional blocks had significantly lower morphine consumption, shorter extubation times, and better hemodynamic stability compared to those who did not receive a block. regional anesthesia can be considered an essential component of multimodal analgesia strategies, providing significant benefits in reducing opioid consumption, enhancing recovery, and stabilizing hemodynamics in cardiac surgery patients. Block patients experienced better outcomes, including shorter extubation time and lower pain scores, indicating a potential benefit for incorporating regional anesthesia in cardiac surgery protocols.

SUMMARY

SUMMARY

The aim of this study on multimodal analgesia strategies for cardiac surgery is to evaluate the effectiveness of different pain management approaches, specifically comparing the use of regional blocks (block group) and systemic analgesia (non-block group). The study focuses on assessing outcomes such as pain control, opioid consumption, extubation time, heart rate stability, and overall recovery time post-surgery. The goal is to determine which analgesic strategy offers superior benefits in terms of pain relief, reduced side effects, and faster recovery for patients undergoing cardiac surgery. The study comparing multimodal analgesia strategies in cardiac surgery found that regional block techniques (Group 1) provided superior pain management compared to systemic analgesia (Group 2). Patients in the block group experienced significantly lower pain scores, reduced opioid consumption, and faster recovery, including quicker extubation times and shorter ICU stays. The block group also showed more stable heart rates post-surgery. These findings suggest that multimodal analgesia with regional blocks enhances pain control, reduces opioid use, and accelerates recovery in cardiac surgery patients.

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