DEXMEDETOMIDINE VERSUS PROPOFOL SEDATION REDUCES DELIRIUM AFTER CARDIAC SURGERY; A CROSS SECTIONAL STUDY

SUPERIOR UNIVERSITY

Thesis Submitted to

The Superior University Lahore

In Partial Fulfillment of the

Requirement for the Degree of

Master of Science in Allied Health Sciences

By

NOUMAN AHMAD

Roll No. SU91-MSAHW-S23-117

Faculty of Allied Health Sciences
The Superior University Lahore
2023-2025

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DEDICATION

This thesis is dedicated to my parents, whose unwavering support, unconditional love, and constant encouragement have been the foundation of my journey. Your sacrifices and belief in me have been my greatest strength.

To my family, thank you for being my pillars of support, for celebrating my successes, and for standing by me in times of struggle. Your presence has made this achievement all the more meaningful.

I am deeply grateful to each of you for inspiring me to reach higher and pursue my dreams.

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In the end, I would like to extend my deepest gratitude to my family members. Without their encouragement, I would not have been able to complete this endeavor. (You can always choose your own wordings; this is only a format/ sample to be followed for uniformity of all thesis).

Nouman Ahmad

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LIST OF ABBREVIATIONS

DEX	Dexmedetomidine
PRO	Propofol
CS	Cardiac Surgery
DL	Delirium
ICU	Intensive Care Unit
POD	Postoperative Delirium
HDS	Hemodynamic Stability
RCT	Randomized Controlled Trial
SDN	Sedation
VAS	Visual Analog Scale
ECG	Electrocardiogram
HR	Heart Rate
BP	Blood Pressure
SD	Standard Deviation
CI	Confidence Interval
MAP	Mean Arterial Pressure
SpO_2	Peripheral Oxygen Saturation
PACU	Post-Anesthesia Care Unit

ABSTRACT

Introduction

Postoperative delirium (POD) represents a notable complication subsequent to heart surgery. The use of dexmedetomidine for delirium prophylaxis is still debated. The authors hypothesised that dexmedetomidine sedation after cardiac surgery would reduce the incidence of postoperative delirium (POD).

Materials and Methods

After getting the all-clear from their institutional review boards, patients who were 60 and up and having heart surgery took part in a cross-sectional study. This study did not include patients with a preexisting diagnosis of dementia, delirium, or major depressive illness. Each patient admitted to the intensive care unit (ICU) received four hours of either propofol or dexmedetomidine based on a computer-generated randomisation code. The initial dose was 0.4 μg/kg then 0.2 to 0.7 μg kg−1 h−1 was administered by infusion. Patients were assessed for delirium every twelve hours using either the ICU confusion evaluation method or the post-discharge confusion assessment method for the five days following surgery. Success was primarily measured by the frequency of POD.

Results

The purpose of this research was to determine whether postoperative delirium was more common in patients given dexmedetomidine and propofol for sedation during cardiac surgery. The dexmedetomidine group had a shorter length (2.2 ± 0.9 vs. 3.5 ± 1.3 days, $p = 0.01$), started sooner (18.4 ± 4.5 vs. 22.7 ± 5.2 hours, $p = 0.02$), and had a lower incidence of delirium (16% vs. 30%, $p = 0.08$). There was a noticeable difference between the groups when it came to the length of time spent in the hospital and the length of time spent in the critical care unit (2.4 ± 0.9 vs. 3.8 ± 1.2 days, $p < 0.001$) in the group that received dexmedetomidine. Compared to 44%, 20% of patients required rescue analgesia less frequently, and the pain scores (VAS) were lower (3.2 ± 1.1 vs. 5.6 ± 1.3, $p < 0.001$). Even though the expenses in the acute care unit were similar, dexmedetomidine led to higher sedative costs (750 ± 200 USD vs. 600 ± 150 USD, $p < 0.001$). Based on these findings, dexmedetomidine is superior to propofol for delirium control, reducing hospital stays, and improving postoperative outcomes.

Conclusion

Overall, compared to propofol-based sedation, postoperative dexmedetomidine sedation had fewer cases of postoperative delirium (POD), a later start, and a shorter duration in older patients undergoing heart surgery.

Keyword: Dexmedetomidine, Propofol, sedation, delirium, postoperative delirium, intensive care unit

CHAPTER 1

INTRODUCTION

Delirium is a cognitive disorder marked by sudden and variable deficits in attention and awareness. surgical delirium frequently manifests between surgical days 2 and 5. While its prevalence in the general surgical population is 2–3%, it has been documented to manifest in as much as 50–70% of high-risk patient cohorts. The incidence of postoperative delirium is linked to significantly elevated morbidity and death, as well as heightened healthcare resource utilization (1).

Research involving both animals and humans has resulted in the formulation of multiple ideas concerning the pathophysiology of postoperative delirium, prompting the proposal and development of innovative treatments. Currently, there are restricted therapeutic choices accessible for clinical application. Currently, the most efficacious strategy for managing postoperative delirium involves implementing risk reduction strategies, including reorientation, dexmedetomidine, and melatonin. Moreover, there is still insufficient consensus regarding optimal perioperative techniques (including fasting duration, anaesthesia selection, perioperative fluid administration, and blood pressure management) to mitigate the risk of delirium(1–3).

The framework of risk assessment, risk reduction, and rescue treatment has been implemented for various surgical problems through the advancement of enhanced recovery pathways. Utilizing this framework, we performed a comprehensive literature search on EMBASE and Medline for pertinent studies published in English from 2000 to 2019. The search criteria were determined according to the guidelines of the American Society for Enhanced Recovery, Perioperative Quality Initiative, European Society of Anaesthesiology, and other prevalent perioperative factors. The search concluded on January 28, 2020, and ongoing literature surveillance persisted until March 30, 2020. The literature findings are encapsulated in a narrative review, addressing the existing clinical data for delirium risk prediction scores, perioperative therapies for mitigating delirium risk, and treatment alternatives for diagnosed delirium(4).

Notable complications that might arise after surgery include postoperative delirium and non-cardiac diseases (NCDs), including postoperative cognitive dysfunction (POCD). Disturbances in attention, consciousness, and cognition characterized by an abrupt onset of variable changes in mental status following surgery are known as

postoperative delirium. Depending on variables like the type of surgery and patient vulnerabilities, this syndrome can occur between hours to days after surgery, particularly in elderly persons. The incidence rates range from 5% to 52%. On the other hand, non-communicable diseases (NCDs) cover a broader spectrum of cognitive impairments; surgery-induced cognitive decline is explicitly referred to as post-operative cognitive decline (POCD). Postoperative cognitive dysfunction (POCD) is defined by impairments in memory, attention, and executive function that last much beyond the first few days after surgery. Different clinical manifestations characterize the three primary categories of postoperative delirium(5). A person with hyperactive delirium may have hallucinations or delusions in addition to restlessness, agitation, and hypervigilance. The patient's increased activity levels make this subtype easy to spot. Hypoactive delirium, on the other hand, is the most prevalent type and is characterized by a lack of energy, sluggish movement, and a sluggish reaction to external stimuli. Due to its modest appearance, this subtype is often misdiagnosed, even though it may have poorer prognoses. Patients experiencing mixed delirium oscillate between states of agitation and lethargy, exhibiting characteristics of both hyperactive and hypoactive delirium(6).

Among the many neurocognitive disorders, postoperative cognitive dysfunction (POCD) is associated with certain types of surgeries. One example of a noncommunicable disease is dementia, which is marked by a gradual and ongoing loss of cognitive abilities that poses problems in day-to-day living. Acute and transitory delirium can happen in many different medical contexts, not just after surgery. For proper diagnosis and treatment, it is essential to grasp these differences. A battery of diagnostic tests and criteria are used to confirm a POD or POCD diagnosis. The DSM-5 states that in order to diagnose delirium, one must observe that the patient has a transient (often hours to days) and variable (in severity) disruption of attention and consciousness. This disruption must have occurred as a direct physiological result of some other medical issue, drug overdose, withdrawal, or toxic exposure. Common symptoms of delirium that are evaluated by the Confusion Assessment Method (CAM) include sudden onset, lack of concentration, disorganized thought processes, and changes in consciousness levels. A short 30-item test that evaluates orientation, memory, and attention, among other cognitive areas, the Mini-Mental State Examination (MMSE) screens for cognitive impairment. To better understand POCD-

related cognitive impairments, more extensive neuropsychological testing may be administered (7,8).

For successful prevention and therapy, it is vital to understand the risk factors linked with POD and POCD. There are three broad categories into which these risk factors fall: those that are specific to the patient, those that are specific to the operation, and those that are environmental and postoperative. The progression of POD and POCD is greatly affected by patient-related variables. The physiological changes and cognitive deterioration that come with aging make older persons more susceptible to the effects of this risk factor, which is age itself. These problems also manifest more frequently in people who already have cognitive impairments, such as dementia or mild cognitive impairment. This risk is amplified when there are comorbidities. Brain perfusion can be impacted by cardiovascular disease and diabetes, especially when glycemic control is inadequate, can lead to microvascular problems that compromise cognitive performance. A history of depression is linked to an increased vulnerability to cognitive deterioration following surgery, making depression another important concern. The likelihood of developing POD and POCD is influenced by medications as well(9). The risk of delirium increases when anticholinergic drugs reduce cognitive function. Another factor that can increase the likelihood of cognitive problems following surgery is the use of benzodiazepines, which, particularly in older patients, can lead to drowsiness and disorientation. When calculating the potential for POD and POCD, consideration of surgical-related variables is paramount. A high incidence of postoperative complications (POD) is common in cardiac surgery owing to variables including cardiopulmonary bypass and prolonged anesthesia, but this is only one example of how the type of surgery performed can greatly affect results. Notable cognitive changes can also occur after orthopedic procedures, especially those involving large joints. Cognitive impairment is more likely to occur with longer procedures and prolonged exposure to anesthesia owing to greater physiological stress and the possibility of complications; this is an additional crucial issue to keep in mind while planning your surgery. Cognitive impairment can be exacerbated by intraoperative conditions such low blood pressure, hypoxia, and blood loss. Both hypoxia (low oxygen levels) and hypotension (inadequate blood flow to the brain) can have detrimental effects on brain function during surgery. Hypovolemia, which can occur after a substantial loss of blood, raises the risk of cognitive impairment even further. There are a number of postoperative and environmental variables that can play

a major role in the onset of postoperative complications. Effective pain control measures are crucial for cognitive recovery after surgery since ineffective pain management can lead to delirium. There is an increased risk of delirium in the intensive care unit (ICU) due to factors such as noise, lights, and frequent monitoring, all of which interfere with sleep cycles. Furthermore, delirium and cognitive decline might be worsened by surgical infections and complications including pneumonia or urinary tract infections. For the best possible recovery and the least amount of cognitive impairment, it is essential to monitor and manage these issues(10,11).

Acute changes in mental status, such as disorientation, agitation, lethargy, poor attention, disorganized speech, and, in extreme instances, delusions and hallucinations, characterize postoperative delirium. Cognitive deficits cover a wider range in postoperative NCDs. Among these conditions are postoperative cognitive decline (POCD), which lasts for a long time after surgery, and postoperative oedema (POD), which can cause cognitive loss in the long run and, in extreme cases, dementia. Depression, delirium, and dementia must be distinguished. The symptoms of delirium include a sudden start, a changing course, and the fact that it can be reversed, usually by addressing the underlying reasons. Dementia, on the other hand, is characterized by a slow start, steady deterioration, and irreversibility; it is usually linked to neurological disorders. Mood disturbance treatment can alleviate cognitive symptoms of depression, which are more commonly associated with a lack of desire than with actual cognitive impairments. The identification and management of POD and NCDs rely heavily on diagnostic criteria and techniques. Evidence of attention and awareness disruptions and a change in cognition that a preexisting condition cannot explain are the DSM-5 criteria for delirium. The delirium rating scale and the CAM are screening measures that can be used to detect and evaluate the degree of delirium. Also used for both pre- and post-operative cognitive evaluations are neuropsychological tests for POCD. It is critical to comprehend how cognitive symptoms develop and when they occur following surgery. Within hours to days after surgery, delirium may appear, with symptoms typically being at their worst on the first or second day after the procedure. Patients who had POD while in the hospital are at an even higher risk of POCD in the first month. In individuals with inherent vulnerabilities, such as moderate cognitive impairment or dementia, POD can cause longer-term cognitive loss, despite the fact that POD is often temporary(12,13).

In this modern era, cardiovascular disease has emerged as a major public health concern. Both the number of people diagnosed with cardiovascular disease and the number of surgeries performed to treat it have skyrocketed in recent years. There are over 1.5 million cardiac procedures conducted annually around the world, and the prevalence of problems after these surgeries ranges from 2 to 60%, according to the most recent report. With a rate of 25-52%, POD is the leading cause of complications for patients undergoing heart surgery. A bad prognosis is associated with this sudden disruption of consciousness, which is defined as erratic shifts in focus, awareness, and thought processes. The societal and financial toll of delirium is substantial, with an annual cost to healthcare in the US of almost $164 billion, according to a study published in Lancet. Consequently, the public is paying more attention to the prognosis of POD(14).

Recent years have seen a mountain of evidence linking postoperative nausea and vomiting (PODS) to a very bad prognosis for patients after heart surgery. Having said that, opinions differ on the outcomes. The mortality rate for cardiac surgery patients with postoperative nausea and vomiting (PODS) is greater than that of individuals without POD. However, there are many who argue that POD has no bearing on death rates. Our literature search revealed that there is just one study that examined the correlation between POD and mortality in TAVR patients; this analysis was published in 2020, and it only comprised seven studies with a small sample size. Research conducted in isolation lacks the statistical clout to draw firm conclusions and resolve discrepancies. In addition, there has been no quantitative assessment of how POD affects hospital days, intensive care unit time, and MV time(15).

Notably, delirium does not receive appropriate attention due to under-reporting and inadequate recognition. Healthcare providers could better direct scarce resources toward lowering delirium-related morbidity and death if they were aware of the actual scope of POD and its related consequences in patients undergoing heart surgery.

Important postoperative consequences include neurocognitive disorders (NCDs) and postoperative delirium (POD), which are more common in the elderly and people with a history of cognitive impairment. Within hours to days following surgery, patients with postoperative confusion (POD) may begin to experience a sudden and variable disruption in their attention, awareness, and cognition. Postoperative cognitive dysfunction (POCD) is one of several neurocognitive diseases that can manifest in the days, weeks, or even years following surgery. All three of these factors—patient

outcomes, healthcare expenditures, and quality of life—make these illnesses difficult to treat(16).

The key to better surgical results and faster recovery after surgery is a better understanding of the causes and processes of postoperative complications (PODs) and non-complicational deaths (NCDs). Rates of POD can reach 50% in specific groups, including those having cardiac or orthopedic procedures, but this figure varies greatly depending on the surgical type, patient demographics, and diagnostic criteria utilized. Similarly, non-communicable diseases (NCDs) can leave a long-term effect; for example, some patients may have cognitive impairments that keep coming back, making it hard for them to resume their regular lives. Longer hospital admissions, higher rates of release to long-term care facilities, increased morbidity and mortality, and a considerable economic burden are all related with these conditions(17).

Patients and healthcare systems are greatly affected by POD and NCDs, thus it's crucial to learn everything we can about their causes, risk factors, and ways to control them.

In patients on mechanical ventilation, early profound sedation is a risk factor for complications and death in the hospital. The current goal is to decrease the drug-induced mortality risk by transitioning from full to light sedation with daily brief cessations.

James Robinson, a dentist from London, first showed the English people how to administer the anesthetic gas ether in 1846. William Morton, in Boston, across the Atlantic Ocean, had done the same thing a few months earlier. John Snow had conducted experiments in his home-made laboratory using ether to promote anesthesia by respiration a few years prior, in 1843. Thanks to Ether, John Snow was able to use his knowledge of both the lab and the clinic to a powerful molecule whose exact characteristics remained a mystery(18). In 1847, obstetrician James Young Simpson of Edinburgh brought chloroform to the medical world. John Snow devoted as much time to researching chloroform as he had to ether. It didn't take long for him to figure out that, compared to ether, chloroform was significantly more strong, making precise administration and close patient monitoring even more crucial(19).

There were still a lot of unknown dangers and effects associated with anesthesia back then. New, less dangerous types of anesthesia took a long time to develop. Several cases of bulbar polio, which causes respiratory paralysis, were among the many cases of a devastating poliomyelitis epidemic that hit Copenhagen in 1952. About 1,250

people, out of approximately 3,000 polio patients admitted between August and December, experienced paralysis of some kind. With 27 deaths out of 31 bulbar polio patients in the first three weeks of the outbreak, 19 of those patients passed away within the first three days of admission. Although we believed we had some knowledge regarding the treatment of bulbar and respiratory poliomyelitis, it quickly became apparent that very little of our initial knowledge was truly valuable, according to Henry Lassen, the head physician at the institution. Patients suffering from respiratory paralysis were aided by the anesthesiologist Bjørn Ibsen's use of manual bag ventilation during the early stages of the epidemic. A youngster who had contracted tetanus and was being curarized and breathed manually through a tracheostomy had earlier been treated by Ibsen in 1952. The use of very little sedation during the creation of these early mechanical ventilators in the 1950s is noteworthy. In a way, it was the forerunner of current intravenous sedation techniques(20,21).

It is thought that propofol, a short-acting medicine that was approved in the late 80s, works at least partly via a GABA receptor and causes a decrease in consciousness and a lack of memory for events. Modifications to the heart rate, particularly bradycardia, and hemodynamic instability are common propofol adverse effects. Use at high doses over an extended period of time may cause hypertriglyceridemia because of its phospholipid carrier. Sedation with propofol begins quickly (within 1 minute) and lasts just a short while. When conducting a clinical examination on a patient with neurological symptoms, this may be of interest. The recovery time is short, however it can take longer if you use it for longer than 12 hours. Preventing propofol infusion syndrome requires a dose of no more than 4 mg/kg/h(22).

The two most common alpha-2 agonists used in the intensive care unit are clonidine and dexmedetomidine, with dexmedetomidine having the upper hand. Clonidine elevates parasympathetic activity and decreases norepinephrine release by stimulating brainstem presynaptic alpha-2 adrenoreceptors. Clonidine may act on the locus coeruleus to provide its sedative, analgesic, and anxiety-reducing effects. There is still not enough evidence to recommend routinely administering clonidine to critically sick patients who are on mechanical ventilator for sedation, despite a comprehensive evaluation and meta-analysis that looked into the drug's effectiveness and safety in this setting. One of the unique mechanisms of action of dexmedetomidine, an alpha-2 adrenoreceptor agonist, is to provide drowsiness and anxiolysis through locus coeruleus receptors, analgesia through spinal cord receptors, and reduction of the

stress response without substantial respiratory depression. A dose-dependent risk of hypertension, hypotension, and bradycardia are among the side effects of both medications. Patients with hepatic or renal failure should have their dose altered because it is cleared by hepatorenal routes. Alpha-2 adrenoreceptor agonists are a potential one-drug solution for mild sedation, even if they aren't widely used in the US(23,24).

The scientific community has been debating the relative merits of various sedatives for intensive care unit (ICU) sedation, including propofol, benzodiazepines, alpha-2 adrenoreceptor agonists, and sevoflurane. Twelve studies examined the use of benzodiazepines with propofol for intensive care unit sedation. They demonstrated that compared to benzodiazepines, propofol reduced the amount of time it took for patients to go from light sedation to extubation. We recognize that propofol sedation enabled faster tracheal extubation compared to midazolam in large trial data, however this did not lead to an earlier ICU discharge. We can conclude from these results that propofol is more beneficial than benzodiazepine sedation for intensive care unit (ICU) patients(25).

Three primary outcomes, including mechanical ventilation duration, intensive care unit stay length, and delirium prevalence, were examined in randomized control trials between dexmedetomidine and benzodiazepines. On a worldwide scale, they comprised little under three thousand patients. Studies that aimed to minimize bias found that compared to patients given a benzodiazepine infusion, those given dexmedetomidine required less time for extubation and were less likely to have delirium. Thus, a conditional recommendation favoring dexmedetomidine was provided for ICU sedation because the benefits of dexmedetomidine likely exceed those of benzodiazepines(26,27).

In three further investigations, dexmedetomidine and propofol were compared for usage in the intensive care unit. The time it took to extubate was the same for both. Studies comparing propofol and dexmedetomidine for sedation found no difference in the incidence of adverse effects such as bradycardia or hypotension, even in the absence of any other primary end aim. Finally, fifteen trials compared intravenous medication administration to inhaled sevoflurane. There was no change in the durations of the intensive care unit stays or hospital stays after administering volatile sedation with an anaconda system; however, the awakening time was lowered(28,29).

Nowadays, it is crucial to evaluate sedation in intensive care unit patients, but this was not truly the case twenty years ago. It is essential to assess the correct dosage of sedatives with great care. In the intensive care unit, the comfort of the patient should always come first, yet getting the right amount of sedation can be difficult. One intriguing approach to achieving this goal is the use of sedation scores. The Sedation-Agitation Scale (SAS), developed by Ricker for his study, is the gold standard for sedation scores; the RASS displays both of these scales. In the intensive care unit, the RASS was compared to the SAS and analyzed, but no significant changes were found in patient outcomes. Several sedatives have been tested using it. In the most recent research, researchers evaluated the effects of dexmedetomidine and propofol, two light sedatives that are commonly prescribed to patients on mechanical ventilation who are suffering from sepsis. Neither the propofol group's nor the dexmedetomidine group's results differed(30,31).

Patients sometimes experience new abnormalities in global cognition or executive function after their intensive care unit stay, along with other forms of cognitive dysfunction that are poorly understood and last for a long time. Since more critically sick patients are being treated in intensive care units, it is likely that this is contributing to the rising incidence of long-term cognitive dysfunction following an ICU stay. The problem is more worse for elderly individuals because cognitive impairment is linked to higher institutionalization and additional hospitalization. Finally, cognitive impairment following a critical illness is prevalent and, in certain cases, lasts for a year or more. Cognitive deficits are more common in post-intensive care unit patients whose delirium lasted longer than in those whose delirium lasted shorter(32).

Sedation techniques for intensive care unit patients have evolved significantly since I first started working in this field in the year 2000. At first, patients were put to sleep using a combination of benzodiazepines, morphine derivatives (sufentanil), and neuromuscular blocking agents. The patient had to be conscious enough to be extubated before the sedation could be stopped. In patients with liver or kidney failure, the time between the end of sedation and

extubation could be lengthy. Since 2010, we have been suggesting a systematic approach to sedating intensive care unit patients with the full support of the medical staff, including nurses and pharmacists. Based on this, we were able to suggest a sedation policy for our three intensive care units that primarily involved the use of morphine for pain relief and midazolam for sedation. It was recommended that NMBA be administered solely to patients with ARDS and postcardiac arrests, and not to all patients on mechanical ventilation. A streamlined tool for assessing sedation was employed: the Brussels Sedation score. A change to the sedatives used in our intensive care units occurred five years after that. Only patients with epilepsy or those experiencing recreational drug or alcoholic intoxication will still have access to midazolam, as we have discontinued its use in our anesthetic medications. Sedation was achieved for all other patients with propofol or dexmedetomidine. Particularly with morphine and sufentanil, analgesia was maintained; otherwise, acetaminophen, ketamine, lidocaine, and nonsteroidal anti-inflammatory drugs (NSAIDs) were recommended (the 2015 protocol update). Following this proposal, we examined drug usage beginning in 2014 to determine whether our modifications to intensive care unit sedation could influence the yearly quantities of medications used in the years following the protocol change. Over time, the new procedure reduced the use of midazolam and other sedatives, allowing for a greater emphasis on propofol and dexmedetomidine. Quickly assessing and reducing sedation was the goal. The use of opioids, particularly morphine, was drastically cut down upon, and when necessary, it was administered directly into the veins rather than through continuous intravenous drips. Patients appear to benefit from family visits in their evolution, to conclude. Any future intensive care unit designs must adhere to a framework based on patients' and their families' demands. A future-proof of idea, patient-centered care, functionality, safety, and innovation should be the primary goals of every new department's design(33–35).

AIMs AND OBJECTIVE

- The objective of this study is to evaluate and compare the effectiveness of dexmedetomidine and propofol sedation in reducing the incidence and severity of postoperative delirium (POD) in patients undergoing cardiac surgery.
- It aims to assess the hemodynamic stability and safety profiles of both sedatives while identifying factors influencing the risk of delirium in this patient population.
- By providing evidence-based insights, the study seeks to optimize sedation strategies to enhance postoperative recovery and improve overall patient outcomes following cardiac surgical procedures.

CHAPTER 2

LITERATURE REVIEW

A reversible disruption of neurons generated by a systemic disturbance underlies the neuropsychological illness known as delirium. It suggests brain malfunction and is characterized by acute end-organ dysfunction.To aid in the categorization and diagnosis of mental diseases, the American Psychiatric Association released the Diagnostic and Statistical Manual of Mental diseases, Fifth Edition (DSM-5).The DSM-5 states that in order for delirium to be diagnosed, there must be a transient and unpredictable disruption of attention, cognition, or consciousness. The patient's baseline brain function should not be the same as the altered brain function. There are three varieties of delirium that have been recognized by experts: hyperactive, hypoactive, and mixed. Ten minutes following anesthesia is the cutoff time for postoperative delirium (POD), which can last for as long as seven days in the hospital or until release.A transient, unpredictable, and typically reversible disruption of mental state accompanied by a degree of inattention is what is commonly seen non the post-anesthesia care unit (PACU). Changes in brain function are distinct from profoundly decreased arousal or drowsiness. Common forms of POD include hypoactive delirium(36).

Changes in perception, cognition, attention, and consciousness are caused by the acute cerebral disorder known as delirium. Postoperative delirium (POD) affects 20% to 50% of patients undergoing cardiac surgery, with the highest incidence in individuals aged 65 and above.(1) POD causes distress for patients and their loved ones, which in turn increases the likelihood of sickness, death, length of hospital stays, and overall healthcare expenditures (2).

Perioperative therapy for delirium prevention are less well understood than the causes and effects of postoperative nausea and vomiting (PODS). However, there is some evidence that this particular sedative increases the risk of delirium in critically sick patients (3-6). Recent meta-analysis of fourteen prospective randomized clinical trials indicated that dexmedetomidine, in comparison to midazolam sedation, decreased the occurrence of delirium in critically ill patients. The new pain, agitation, and delirium guidelines suggest that patients should spend less time in the ICU (7). These recommendations aim to reduce the amount of time patients spend on artificial ventilation and substitute benzodiazepines with propofol or dexmedetomidine. The

incidence of delirium was not reduced in critically ill patients treated with dexmedetomidine, according to a recent Cochrane analysis. Research heterogeneity, inaccurate delirium measurements, and the lack of delirium as an important end measure were the reasons given by the review for this finding. It is crucial to conduct prospective evaluations of delirium using reliable and validated tools at regular intervals in order to determine the actual rates of POD. The only research that has investigated delirium following cardiac surgery using a priori hypotheses and verified instruments is a single small study comparing sedative regimens based on dexmedetomidine, midazolam, and propofol (9–11). As a result, main evidence on the precise pharmaceutical preventative methods to lessen POD following heart surgery is lacking. This study examined the postoperative sedative regimes based on dexmedetomidine and propofol in older individuals having heart surgery. A cross-sectional design was employed in this investigation.

An aggravation of an existing insult or injury, or the possibility of a new insult or damage, might induce delirium.Various research have sought to determine what variables increase the likelihood of postoperative delirium.Dementia is classified in the DSM-5 as:

POD ought to be classified as an independent group. This time frame begins immediately following surgery and ends with the patient's discharge. Diagnosing POD independently of emergence delirium is not recommended; however, it is important to record any lucid phase following emergence delirium. Preoperative, intraoperative, and postoperative factors are the three main categories into which factors that could lead to postoperative complications (POD) fall(37,38).

The incidence of postoperative complications (POD) rises in proportion to the degree of the surgical injury. The prevalence of postoperative nausea and vomiting (POGD) in non-cardiac surgeries ranges from 15% to 54% in the DSM-5, with the exact percentage depending on the screening method. Throughout their whole stay, the incidence can reach 70 to 80% in the intensive care population. Similarly, the incidence ranges from 26% to 52% in individuals undergoing heart surgery.A lack of a clear differentiation between emerging delirium and POD contributes to the large disagreement in the research, despite the widespread and similar incidence of POD compared to other settings.Underdiagnosis of the most prevalent form of delirium—hypoactive delirium—which is marked by lethargy, decreased responsiveness, and decreased activity level—has likely occurred since previous research has concentrated

on hyperactive delirium, which is usually identified as an agitated patient in the PACU yanking at lines and tubes. Failure to employ routine delirium monitoring increases the likelihood of this type being undetected.Despite these caveats, comorbidities, the intensity of the surgical insult, and exposure to sedatives or analgesics are major determinants of the incidence and risk factors of postoperative nausea and vomiting (POD) reported in the literature(39,40).

When assessing POD, it is necessary to first ascertain whether the subject is receptive to vocalization. A person is said to be in a coma if they are not awake enough to speak. The delirium instruments can test for changes in mental status, such as inattention and altered level of awareness, to evaluate the content of the arousal once the level of arousal has been determined.The arousal level is most often evaluated using the Richmond Agitation Sedation Scale.Patients who are unconscious or in a heavy sedative condition cannot be evaluated for delirium any more.For the purposes of the DSM-5, delirium is defined as: Difficulty focusing, maintaining attention, and shifting focus, as well as a generalized lack of awareness of one's surroundings.

A transient disruption, which can last anywhere from a few hours to several days, is characterized by a shift from one's normal state of attention and consciousness and whose intensity varies throughout the day. A further cognitive impairment (such as a loss of memory, confusion, language, visual-spatial skills, or perception). There is no other neurocognitive illness that better explains the problems in Criteria A and C, and they do not happen in a very low degree of arousal, like coma. The patient's medical history, assessment of physical function, and laboratory results all point to the disturbance being a direct physiological effect of another medical condition, drug or medication intoxication or withdrawal, toxic exposure, or a combination of these factors(41). Many delirium evaluation techniques have been validated for use with different patient populations and in different parts of the hospital, such as the ward or the intensive care unit after surgery.Among them are:

The most popular methods include CAM and its variants. Shortened forms of CAM that conduct real-time evaluations for delirium include the CAM-ICU and 3D-CAM. The non-intensive care unit environment has validated the Brief Confusion Assessment Method. Validation of the CAM-ICU for intubated patients undergoing mechanical ventilation has been completed. Two scales that can be used to measure the severity of delirium are the Memorial Delirium Assessment Scale and the Delirium Detection Scale (DDS)(42,43).

Early intervention in delirium, using both nonpharmacological and pharmacologic measures, can reduce the likelihood of long-term unfavorable effects. There have been successful attempts at nonpharmacological therapies. A few of well-known programs that fall within this category include HELP and its variants. The patient is reoriented, socialized, visited daily by family members, nutrition and nourishment balanced, sleep-wake cycles managed, noise reduced, sensory aids provided, and early mobilization are all goals of these programs' interdisciplinary teams. The occurrence of delirium was found to be significantly reduced in the intervention group when Chen et al. used three protocols—orienting communication, oral and nutritional aid, and early mobilization—that were provided daily. Additionally, the ABCDEF bundle has been linked to better outcomes in brain function when administered in the intensive care unit(44,45).

Daily goal-directed mobility program participants had longer durations of survival without delirium, shorter hospital stays, higher levels of functional independence upon discharge, and a higher likelihood of being discharged home, according to research by Hayhurst et al.It is important to assess patients' risk of POD in order to implement measures for prevention, early intervention, and treatment. Promptly stating the patient's name, present location, surgery type, and surgeon's name is one way to begin reorientation in the PACU. Immediate attention is required for physical problems such a bloated bladder, hypoventilation, discomfort, awkward patient placement, and so on (46,47).

The treatment and prevention of delirium in high-risk populations has made use of many pharmacologic medications.The persistent effects of anesthetic drugs should be countered forcefully in cases of persistent delirium. To counteract the effects of benzodiazepines, opioids, and muscle relaxants, you can take flumazenil (0.2 mg increments), naloxone (0.04 mg increments), or physostigmine (1-2 mg increments), which can penetrate the blood-brain barrier. A common medication for the short-term treatment of delirium, Haldol reduces the duration and intensity of episodes without altering their frequency. Additionally, high-risk elderly populations do not respond to haldol when used for prevention purposes. A new and helpful addition to general anesthesia is dexmedetomidine. In high-risk elderly patients, dexmedetomidine intraoperative infusion decreased the occurrence of postoperative nausea and vomiting.Evidence suggests it reduces postoperative pain, nausea, and agitation in children and intensive care unit patients. But the best way to provide it during surgery,

whether by infusion or boluses, is still up in the air. For intensive care unit patients whose agitated delirium delayed extubation, dexmedetomidine sped up the resolution of delirium, reduced the need for antipsychotic medication, and allowed for quicker extubation.Compared to haloperidol, dexmedetomidine shortened intensive care unit stays, decreased the requirement for noninvasive ventilation, sped up the resolution of delirium, and reduced oversedation in another trial(48).

When compared to placebo, antipsychotic medications like haloperidol, which enhance the availability of acetylcholinesterase, had no effect on delirium.Propofol and dexmedetomidine have replaced benzodiazepines as the go-to sedatives in the intensive care unit due to the high risk of delirium associated with the former.Patients given dexmedetomidine were less likely to experience delirium and had a shorter duration of delirium compared to those given propofol, according to research by Djaiani et al(49).

As part of a thorough physical examination, it is important to quickly assess the patient's vital signs and measure their arterial blood gas and blood glucose levels. Hemoglobin, electrolyte, and blood glucose levels could be approximated in this way. A computed tomographic scan of the head should be seriously examined if new focal neurologic impairments are evident. The particular clinical vignette may dictate the need for a personalized battery of laboratory investigations. Thiamine insufficiency, for example, could be the outcome of a history of alcohol misuse. If the results of the liver function test are abnormal, further testing and a thorough physical examination are needed to confirm the diagnosis. Confirmatory findings include lower blood thiamine levels and elevated levels of carbohydrate metabolites, lactate, and pyruvate(50).

The Food and Drug Administration has not authorized any medication to treat or prevent delirium. Information on effective preventative medicines and first treatments is scarce. Limitations in data on the effectiveness of haloperidol and atypical antipsychotics (olanzapine, quetiapine, risperidone) do not stop their widespread usage. Oversedation, hypoactive delirium, QT prolongation, respiratory depression, and neuroleptic malignant syndrome are among side effects of antipsychotics. Dexmedetomidine necessitates a stay in the intensive care unit and an implant(51,52). There is a strong correlation between POD and considerably worse patient outcomes. Recent research suggests that postoperative dysfunction (POD) may increase the risk of cognitive impairment following surgery, as well as early dementia, brain

dysfunction lasting longer than expected, and a sped-up rate of cognitive decline in Alzheimer's patients. Patients experiencing delirium in the PACU should not be discharged home but should be admitted to a nursing or rehabilitation center instead. This is because it indicates that their brain function may worsen while they are in the hospital. According to the majority of research, delirium is associated with a higher mortality rate(53).

There is a potential increased risk of aspiration in patients with POD, particularly in cases of emergency surgery where the nil per os recommendations were disregarded. A longer hospital stay, higher healthcare expenses, a higher likelihood of institutionalization following discharge, and a higher likelihood of disability are all connected with POD(54,55).

Postoperative cognitive dysfunction (POCD) or postoperative delirium is a common consequence of surgery that affects 70% of patients. It usually strikes between one and three days following surgery and might last for two to five days. Even though it usually goes away on its own, new research links postoperative delirium to a host of long-term health problems, both mental and physical, including PTSD. Families and communities bear the brunt of postoperative delirium's negative effects, which include longer hospital stays, higher healthcare expenditures, worse quality of life, and higher rates of death and complications. Delirium is more common in the elderly, and postoperative cognitive impairment is a popular subject due to the increasing number of people in this demographic. Symptomatic care and the use of sedative adjuvants are typically used to control postoperative delirium, as there is currently no definitive treatment for it. The best way to avoid postoperative delirium is still up for discussion, despite advances in both diagnosis and therapy(56).

Midazolam and other sedatives have been linked to postoperative delirium, according to some researchers. Nevertheless, the paper implies that dexmedetomidine can aid in avoiding surgical delirium, even though the impact on circulation and heart rate is subjective. There has been conflicting evidence about the efficacy of propofol and sevoflurane in avoiding postoperative delirium in previous research. It is critical for anesthesiologists to select the right sedative from the wide variety available in order to reduce the likelihood of postoperative delirium.

The term "general anesthesia" refers to a kind of full-body numbness that relaxes muscles and causes the patient to lose consciousness as well as alleviate pain and memory loss. A broad variety of substances can be used to induce general anesthesia,

either partially or entirely. While the molecular and cellular processes of opioids and other narcotics are well-established, those of inhaled anesthetics are less so. There is currently no agreed-upon method for administering anesthesia during cardiac surgery. Instead, the anesthesiologist's personal preference and years of expertise inform the drug selection process, which takes into account the patient's pathophysiological condition. The four basic components of modern general anesthesia are hypnosis, analgesia, forgetfulness, and muscle relaxation, as defined by the medical community. It seems to reason that medications with these effects would be administered in combination for maximum benefit, even though many of the medicines included in this review can produce more than one of these effects. For instance, all the circumstances needed to appropriately anesthetize the patient during cardiac surgery can be produced by inhaled anesthetics alone (1). Their cardiodepressive effects mean that they are best administered in low doses in conjunction with intravenous medicines that can induce hypnosis in the first place. During cardiac surgery, opioids and muscle relaxants are often used to augment the analgesic and relaxing needs, particularly during high-stimulus events like sternal opening and intubation. Although some hypnotics, such benzodiazepines, exhibit more noticeable amnestic effects than others, amnestic agents might be difficult to distinguish from hypnotic agents. When managing general anesthesia for heart surgery, it is important to keep hemodynamics steady, avoid ischemia, and keep myocardial function preserved(57–59).

Propofol, like many other injectable drugs, works by positively modulating GABA's inhibitory activity. Because it is an emulsion comprising egg lecithin and soybean oil for intravenous administration, propofol's formulation might cause injection pain. Patients with hypersensitivity to these components should not take propofol. Because it dissolves in lipids, propofol can quickly pass the blood-brain barrier and start working; induction happens in as little as 40 seconds (29). Despite being significantly more costly than conventional hypnotics, propofol is quickly gaining favor among anesthesiologists due to its quick metabolism, which allows for early extubation (30). As an alternative to thiopental for intravenous induction, propofol is chosen since it does not have a hangover effect after recovery (29).

There is a dose-dependent relationship between propofol's effect on cardiac function, blood pressure, and heart rate. Although the agent's sedative effects appear to be short-lived, they can reduce heart rate and blood pressure by up to 20% (29). Inducing anesthesia with propofol may not be any better than with etomidate unless a reduction

in blood pressure is the goal (31). Propofol has a modest bronchodilator effect and a mild dose-dependent respiratory depressing effect. Because propofol keeps intracranial pressure at normal or even lower levels, it is safe to use in patients with elevated intracranial pressure. Propofol is a medication that has the potential to protect neurons since its overall actions include lowering ICP, COR, and cerebral perfusion pressure (32).

For anxiety reduction and amnesia, doctors often prescribe benzodiazepines like midazolam and lorazepam. As benzodiazepines bind directly to their CNS receptors, they amp up the inhibitory effects of GABA and other neurotransmitters. The potency of benzodiazepines can be altered by substituting certain rings in their structure, which include a benzene ring and a diazepine ring. In most cases, the kidneys are responsible for excreting benzodiazepines after they have been processed in the liver. The lengthy half-life is a consequence of the slowness of these activities, though(60).

The benzodiazepines' positive effects include a decrease in the cerebral oxygen demand as well as amnestic, sedative, and anxiolytic qualities without any analgesic effects. The cardiorespiratory effects of benzodiazepines, such as a little drop in blood pressure and cardiac output, are less severe than those of thiopental (36). When combined with drugs, these effects become much stronger. In patients with cardiac problems, benzodiazepines are likewise thought to be safer than thiopental (36). Even with little dosages, benzodiazepine respiratory suppression can be severe, particularly in the elderly and when combined with opioids. This is despite the fact that the drug is typically moderate. Thorough monitoring of these patients is essential. Because of its sedative and amnestic properties, midazolam is a great premedication option. Lorazepam, on the other hand, is a popular substitute due to its prolonged duration of effect and strong potency.

One crucial part of postoperative treatment after heart surgery is sedation, which is utilized to decrease the stress response and produce anxiolysis. A perfect sedative for post-cardiac surgery would start working right away, calm nerves and agitation, speed up the healing process after stopping the medication, not build up in the body, have few side effects, and not break the bank. Unfortunately, these clinical standards have not been met by any one treatment or combination of medicines. The central α2-receptor is the target of dexmedetomidine, a powerful and selective agonist. It binds to adrenoreceptors that bind to transmembrane G proteins, but it has no effect on the GABA system. A class of analgesics known as opioid-sparing agents,

dexmedetomidine works by reducing sympathetic outflow from the central nervous system. Because no respiratory depression is caused by this characteristic, it is distinct among sedatives used in the intensive care unit (ICU) and provides sedation and analgesia. Furthermore, high-risk non-cardiac surgeries including α2-agonists have been linked to reduced cardiovascular sequelae(61).

Dexmedetomidine accounts for a mere 4% of the sedatives administered to adults for purposes other than surgery, despite its 2008 FDA approval. The most popular sedatives used in intensive care units in the US and Europe right now are propofol and benzodiazepines. Dexmedetomidine has recently been the focus of a comprehensive evaluation that sought to identify alternatives to general anesthesia for critically ill adult patients undergoing surgery. When compared to more conventional sedatives like propofol, midazolam, and morphine, the authors found that dexmedetomidine shortened patients' stays in the intensive care unit. Because it does not inhibit spontaneous breathing, dexmedetomidine has a positive profile from the perspective of the clinician and can help with mechanical ventilator weaning. The most common side effects of dexmedetomidine, which include hypotension and bradycardia, have restricted its usage in the intensive care unit. The pros and cons of using dexmedetomidine for postoperative sedation have been the subject of debate due to concerns that it may affect hemodynamic stability and raise hospital mortality(62).

On a global scale, almost 2 million heart surgeries are carried out annually. Major complications can occur at rates ranging from 14.4% to 30.1%, despite the fact that the mortality rate of cardiac surgical procedures has dropped substantially as a result of the tremendous progress in surgical techniques. Prolonged hospital stays, increased resource consumption, and greater health care expenses are all linked to these issues. So, optimizing postoperative care for these patients is still an ongoing task.

Sedation is widely recognized as a crucial part of postoperative care following cardiac surgery, significantly impacting patient outcomes. Dexmedetomidine has been linked to a reduction in postoperative problems in patients having heart surgery, according to multiple studies, including two meta-analyses. The two meta-analyses and three of the other trials did not, however, compare dexmedetomidine and propofol side by side. To improve clinical outcomes in adult intensive care unit (ICU) patients on mechanical ventilation, current guidelines recommend sedation techniques employing nonbenzodiazepine sedatives (either propofol or dexmedetomidine) rather than benzodiazepines(63,64).

CHAPTER 3

METHODOLOGY

3.1 Study Design

The study design was cross sectional to evaluate and compare the effectiveness of dexmedetomidine and propofol sedation in reducing the incidence and severity of postoperative delirium (POD) in patients undergoing cardiac surgery. Study Setting

3.2 Study Duration

The duration of the study was six months

3.3 Sample Size

To calculate the required sample size for a finite population using the finite population correction (FPC) factor, we consider the following parameters: a total population size (N) of 1,000,000, an expected proportion (p) of the outcome factor in the population of 7% (0.07), a margin of error (d) of ±5% (0.05), a confidence level of 95% (corresponding to a Z-score of 1.96), and a design effect (DEFF) of 1, assuming a simple random sampling approach. The sample size (n) is calculated using the formula:

$n = [DEFF \times N \times p(1 - p)] / [((d^2 / Z^2) \times (N - 1)) + p(1 - p)]$,

which corrects for the finite population and accounts for sampling variability. This formula ensures that the estimated sample size will provide statistically reliable results with the specified precision and confidence level. The study required 100 patients, 50 in each arm, to accomplish a reduction from 20% to 6% (doubling the observed rate of younger patients).

3.4 Sampling Technique

The sedation procedure utilized to split the patients into two groups was propofol and dexmedetomidine.

3.5 SELECTION CRITERIA

3.5.1 Inclusion Criteria

Participants had to be in a stable enough state to get sedation and provide their informed consent (or have a family member do it for them) to be a part of the study. The study population consisted of patients who were about to have cardiac procedures, such as coronary artery bypass grafting or valve replacement, and were at least 18 years old. Everyone who wanted to take part had to be 18 or older, have to be in the

intensive care unit (ICU) after surgery, and require anesthesia so they could use mechanical ventilation.

3.5.2 Exclusion Criteria

Patients were not eligible for dexmedetomidine or propofol if they had any of the following conditions: hemodynamic instability, serious mental or neurological illness, preexisting cognitive deficits, or were intolerant to either drug. A diverse group of heart surgery patients at risk for postoperative delirium were recruited to participate in the study cohort that compared the two sedation techniques..

3.6 Data Collection Procedure

Anesthesia and CPB Management

Reducing the effect of various anaesthetics on neurological outcomes was the driving force behind the push for standardized anesthesia treatment. Two or three milligrams of oral lorazepam were given as an extra option before treatment. Midazolam was administered at a maximum dose of 0.05 mg/kg during the surgery. Pancuronium (0.15 mg/kg), fentanyl (10 to 12 μg/kg), and propofol (0.5 to 2 mg/kg) were administered to the patient so that they may fall asleep. The levels of isoflurane used to maintain anesthesia varied from 0.5% to 2.0%. In terms of both heart rate and blood pressure, the range from baseline was maintained within 25%. Heparin was given as an anticoagulant to keep the active clotting time above 480 seconds. A mixture of 1.8 liters of lactated Ringer's solution and 50 milliliters of 20% mannitol was used to prime the CPB circuit. Achieving a mean perfusion pressure of 60–80 mmHg, controlling the alpha-stat pH, bringing the systemic temperature down to 34°C, and maintaining pump flow rates of 2.0–2.4 l/min/m2 were all components of the CPB treatment plan. Cardioplegia, which protects the heart muscle from injury, occurred intermittently and was either antegrade or, extremely rarely, retrograde. An arterial perfusion line made in the USA by Avecor Affinity, with a 32-μm filter, was used. By reducing the temperature to 20°C and keeping antegrade brain perfusion constant, deep hypothermic circulatory arrest could be achieved. Patients' core body temperatures were rewarmed to 36° to 37°C before they were removed from CPB. A maximum input temperature of 37°C was chosen for rewarming. Proton sulphate (1 mg/100 U heparin) was used to neutralize heparin following its removal from CPB. Bringing the active clotting time down to 10% of the baseline was one of the targets. A postoperative trip to the intensive care unit was in order for all patients.

Study Drug Administration

This study had an underlying bias that promoted superiority. We hypothesised that delirium rates following cardiac surgery would be reduced with dexmedetomidine sedation relative to propofol sedation. Two groups were established using a computer-generated randomization code. One group was given dexmedetomidine, and the other group got propofol (the control group). To guarantee a subject allocation ratio of 1:1, this was done in four-person blocks. A study coordinator would open the opaque sealed envelopes prior to surgery in accordance with the randomization procedure. Patients who were part of the dexmedetomidine group were given a bolus of the drug, 0.4 μg/kg, over 10 to 20 minutes after they arrived at the critical care unit. Then, they were given an infusion that varied between 0.2 and 0.7 μg kg−1 h−1. It was decided not to administer the bolus dosage to patients who were having hemodynamic instability. The maximum duration for an infusion of dexmedetomidine was 24 hours. The patient's dexmedetomidine infusion was terminated before extubation. In the propofol group, patients were given an infusion ranging from 25 to 50 μg kg−1 min−1 until they were ready to be extubated through the trachea. As per the institution's standard of practice, patients in the dexmedetomidine group were switched to propofol sedation if mechanical ventilation was still required after the 24-hour period. To determine the degree of sedation, a sedation agitation scale (SAS) was used.The patient was observed to be cooperative and calm after twelve titrated infusions of dexmedetomidine and propofol, which provided modest sedation (SAS score of 4). The patient was administered SAS at four hour intervals or more frequently as necessary, such as in the event of a change in their condition. Patients in both groups were prescribed opioid analgesics and nonopioid adjuvants to alleviate postoperative discomfort. For this purpose, we used a conventional visual analogue scale that ranges from 0 (no pain) to 10 (the most terrible pain imaginable) centimeters. Patients who reported analogue pain scores of four or greater were administered two milligrammes of morphine, 0.2 to 0.4 milligrammes of hydromorphone intravenously, or two to four milligrammes taken orally. When determining each patient's dosage, a factor of 0.15 was applied to account for the hydromorphone equivalent of the morphine conversion analogue. The following medications were administered as needed: acetaminophen 325-650 mg, indomethacin 50-100 mg, and no contraindications were discovered.

Study Endpoints

Before surgery (baseline) and again 12 hours after surgery (postoperative), or as needed according to their state, patients were examined using the confusion assessment technique (CAM) for intensive care unit (ICU) to detect the risk of delirium.CAM was used to evaluate delirium during patient transfers from the intensive care unit to the operating room floor. We monitored the patients for delirium symptoms for five days following surgery. They thought the patients were delirious before their CAM tests came back negative. Patients undergoing mechanical ventilation or who had been extubated were cared for by the CAM-ICU. First, mental status alterations or fluctuations; second, inattention; third, disrupted cognitive processes; and fourth, changed state of consciousness were identified using a four-step technique. Delirium was diagnosed when symptoms (1) and (2) were present in addition to symptoms (3) or (4). Patients were considered CAM positive if delirium was detected; otherwise, they were considered CAM negative. The diagnosis of delirium was confirmed after consulting with a psychiatrist. We also recorded when the delirium began and how long it lasted. Both the CAM-ICU and CAM testing groups were unaware of the study's objectives. The initial treatment for delirium was intravenous haloperidol, given in increments of 1–5 mg. It was necessary to modify the dosage every 30-60 minutes. Extra antipsychotic drugs were given when needed.
From the records, we can glean the following important details: the frequency of blood product transfusions; the frequency of inotropic and/or vasoconstrictor support; the frequency of permanent pacemaker implantation; the frequency of severe end-organ failure; the duration of extubation; and the duration of the patient's intensive care unit and overall hospital stay. The time spent in the intensive care unit and on the operating room floor due to delirium was factored into the cost calculation.

3.7 Statistical Analysis

Patients older than 60 years old had a higher incidence of delirium, and the previous study found a 3% delirium rate in patients receiving dexmedetomidine. Before and after the operation, all variables were analyzed descriptively. A two-tailed Student's t test was employed to examine continuous normally distributed data from two separate samples. Nonparametric data were subjected to the Mann-Whitney U test. Using a chi-square test, we compared the two groups to see whether their 2 x 2 contingency tables for the main outcome of delirium were different. With the help of a 95% confidence interval, the odds ratio and percentage CIs were determined. A p-value of less than

0.05 was used to determine statistical significance. Finding a solution that would benefit each patient was our driving force for doing all of these analyses. Minitab Inc. of the United States developed the software MINITAB®, which we used for this statistical analysis.

CHAPTER 4

RESULT

Researchers were unable to differentiate between the propofol and dexmedetomidine groups based on demographic variables. In both groups, the average age was similar (65.4 ± 8.2 years in the dexmedetomidine group and 67.1 ± 7.6 years in the propofol group, p = 0.22). The majority of participants were male (64% and 60%, respectively, p = 0.68). The majority of cardiovascular surgery procedures were coronary artery bypass grafting (CABG). Sixty percent of these instances occurred in the dexmedetomidine group and 56 percent in the propofol group (p = 0.7). Conditions like diabetes (38%), hypertension (62%), and chronic renal disease (14%), which often occur together, were also equally common. Cognitive function (MMSE > 24) and preoperative delirium risk (p > 0.5) were not substantially different. Starting from the same place allows for a reasonable comparison of the two sedation techniques' postoperative outcomes.

Table 4.1. Demographic characteristic of responders

Variable	**Dexmedetomidine Group (n=50)**	**Propofol Group (n=50)**	**Total (n=100)**	**p-value**
Age (years)				
Mean ± SD	65.4 ± 8.2	67.1 ± 7.6	66.2 ± 7.9	0.22
Gender				
Male	32 (64%)	30 (60%)	62 (62%)	0.68
Female	18 (36%)	20 (40%)	38 (38%)	
Type of Cardiac Surgery				
CABG	30 (60%)	28 (56%)	58 (58%)	0.7
Valve Replacement	15 (30%)	18 (36%)	33 (33%)	
Combined Procedures	5 (10%)	4 (8%)	9 (9%)	
BMI (kg/m²)				
Normal (18.5 - 24.9)	10 (20%)	12 (24%)	22 (22%)	0.76

Overweight (25 - 29.9)	20 (40%)	22 (44%)	42 (42%)	
Obese (≥30)	20 (40%)	16 (32%)	36 (36%)	
Comorbidities				
Diabetes	18 (36%)	20 (40%)	38 (38%)	0.68
Hypertension	30 (60%)	32 (64%)	62 (62%)	0.68
Chronic Kidney Disease	8 (16%)	6 (12%)	14 (14%)	0.56
Preoperative Cognitive Function				
Normal (MMSE > 24)	46 (92%)	45 (90%)	91 (91%)	0.72
Mild Impairment (MMSE ≤ 24)	4 (8%)	5 (10%)	9 (9%)	
Preoperative Delirium Risk				
Low	40 (80%)	38 (76%)	78 (78%)	0.64
Moderate	8 (16%)	10 (20%)	18 (18%)	
High	2 (4%)	2 (4%)	4 (4%)	

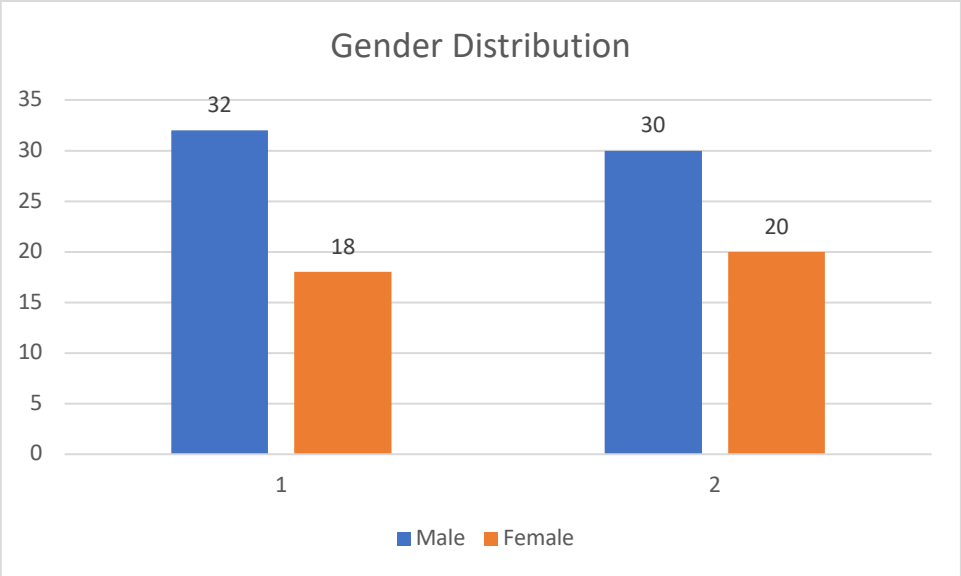

Figure 4. 1 Gender Distribution

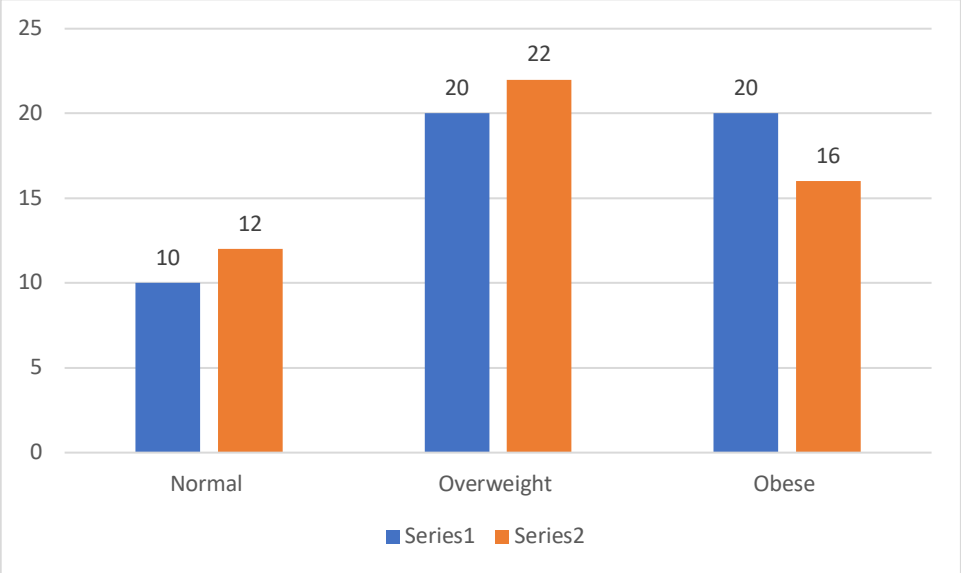

Figure 4.2 BMI Distribution

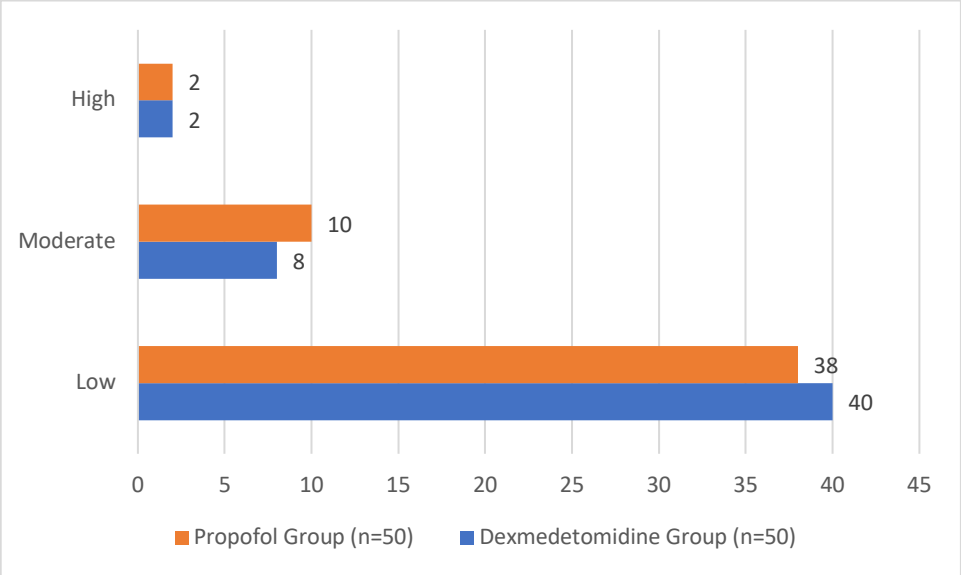

Figure 4. 3 Preoperative Delirium Risk

The propofol and dexmedetomidine groups differed significantly when examining delirium-related outcomes. The percentage of patients with delirium was greater in the propofol group (30%) compared to the dexmedetomidine group (16%), however there was no statistically significant difference ($p = 0.08$). Despite this, the dexmedetomidine group had delirium at an earlier time than the control group (22.7 ± 5.2 hours vs. 18.4 ± 4.5 hours, $p = 0.02$). The group given dexmedetomidine had a significantly shorter duration of delirium (2.2 ± 0.9 days) compared to the propofol group (3.5 ± 1.3 days) ($p = 0.01$). The hospital stays of both delirious and non-delirious patients were considerably shorter in the dexmedetomidine group (10.2 ± 2.5 days vs. 13.8 ± 3.2 days, $p = 0.001$) and 7.8 ± 1.5 days vs. 9.1 ± 2.0 days, $p = 0.05$, respectively. The results indicate that delirium may begin earlier, last shorter, and need less hospital time with dexmedetomidine sedation compared to propofol.

Table 4. 2 group comparison among variables

Variable	Dexmedetomidine Group (n=50)	Propofol Group (n=50)	p-value
Patients with Delirium	8 (16%)	15 (30%)	0.08
Onset of Delirium (hours)			
Mean ± SD	18.4 ± 4.5	22.7 ± 5.2	0.02*
Early Onset (<24 hours)	6 (75%)	9 (60%)	0.38
Late Onset (≥24 hours)	2 (25%)	6 (40%)	
Duration of Delirium (days)			
Mean ± SD	2.2 ± 0.9	3.5 ± 1.3	0.01*
Short (<3 days)	7 (87.5%)	9 (60%)	0.18
Prolonged (≥3 days)	1 (12.5%)	6 (40%)	
Length of Stay (days)			
Mean ± SD	8.5 ± 2.1	11.2 ± 3.0	0.001 *
Patients with Delirium	10.2 ± 2.5	13.8 ± 3.2	0.001 *
Patients without Delirium	7.8 ± 1.5	9.1 ± 2.0	0.05

Following surgery, the dexmedetomidine group fared far better than the propofol group. Neither the incidence of delirium (16% vs. 30%, $p = 0.08$) nor postoperative nausea and vomiting (24% vs. 40%, $p = 0.07$) differed significantly between the control group and the dexmedetomidine group. The group that took dexmedetomidine had considerably lower average pain scores (3.2 ± 1.1 vs. 5.6 ± 1.3, $p < 0.001$) and needed significantly less rescue analgesia (20% vs. 44%, $p = 0.01$). The hospital stays and critical care unit stays of the dexmedetomidine group were considerably shorter compared to the other group (8.5 ± 2.1 days vs. 11.2 ± 3.0 days, $p = 0.001$ and 2.4 ± 0.9 days vs. 3.8 ± 1.2 days, $p < 0.001$, respectively). However, there was no discernible

difference between the groups when it came to reintubation rates (4% vs. 10%) or death rates (2% vs. 6%) in the dexmedetomidine group. Dexmedetomidine improved postoperative outcomes while decreasing healthcare resource requirements overall.

Table 4. 3 postoperative outcomes

Postoperative Outcome	Dexmedetomidine Group (n=50)	Propofol Group (n=50)	p-value
Delirium Incidence	8 (16%)	15 (30%)	0.08
Postoperative Nausea and Vomiting (PONV)	12 (24%)	20 (40%)	0.07
Need for Rescue Analgesia	10 (20%)	22 (44%)	0.01*
Mean Pain Score (VAS 0-10)	3.2 ± 1.1	5.6 ± 1.3	<0.001*
Length of ICU Stay (days)	2.4 ± 0.9	3.8 ± 1.2	<0.001*
Length of Hospital Stay (days)	8.5 ± 2.1	11.2 ± 3.0	0.001*
Reintubation Rate	2 (4%)	5 (10%)	0.24
Mortality Rate	1 (2%)	3 (6%)	0.31

There was a statistically significant difference between the groups given propofol and dexmedetomidine following surgery. While the dexmedetomidine group did have a lower incidence of delirium (16% vs. 30%, $p = 0.08$), the difference was not statistically significant. The dexmedetomidine group showed significantly more profound lethargy, as evidenced by a significantly lower RASS score (-2.1 ± 0.6 vs. -1.5 ± 0.7, $p < 0.001$). A lower Visual Analogue Scale (VAS) pain score (3.2 ± 1.1 vs. 5.6 ± 1.3, $p < 0.001$), a lower need for rescue analgesia (20% vs. 44%, $p = 0.01$), and a smaller dosage of rescue analgesia (22.5 ± 5.8 mg vs. 35.6 ± 8.4 mg, $p < 0.001$) were noted as indicators of dexmedetomidine's improved pain control. Since the dexmedetomidine group received a lower dose (1.8 ± 0.5 mg vs. 2.6 ± 0.9 mg, $p = 0.02$), they also needed fewer antipsychotics (10% vs. 24%, $p = 0.05$). Based on these

findings, dexmedetomidine appears to be superior to propofol in terms of sedation, pain management, and the need for rescue drugs.

Table 4.4 Delirium status

Variable	Dexmedetomidine Group (n=50)	Propofol Group (n=50)	p-value
Incidence of Delirium (%)	8 (16%)	15 (30%)	0.08
Richmond Agitation-Sedation Scale (RASS)	-2.1 ± 0.6	-1.5 ± 0.7	<0.001*
Visual Analog Scale (VAS) Pain Score	3.2 ± 1.1	5.6 ± 1.3	<0.001*
Need for Rescue Analgesia (%)	10 (20%)	22 (44%)	0.01*
Dose of Rescue Analgesia (mg)	22.5 ± 5.8	35.6 ± 8.4	<0.001*
Requirement for Antipsychotics (%)	5 (10%)	12 (24%)	0.05*
Dose of Antipsychotics (mg)	1.8 ± 0.5	2.6 ± 0.9	0.02*

Important differences existed between the delirious and non-delirious patients. The age difference between the two groups was significant (68.4 ± 6.8 vs. 60.2 ± 8.5 years, $p < 0.001$), as was the body mass index difference (28.7 ± 3.4 vs. 26.1 ± 4.2, $p = 0.02$). In the delirium group, hypertension was more common (69.6% vs. 45.5%, $p = 0.04$) and chronic renal disease was more common (21.7% vs. 7.8%, $p = 0.05$). Longer durations of operation (178.3 ± 25.6 vs. 145.7 ± 30.1 minutes, $p < 0.001$), stays in the critical care unit (5.1 ± 2.3 vs. 2.8 ± 1.7 days, $p < 0.001$), and hospital stays (12.7 ± 4.5 vs. 8.4 ± 3.2 days, $p < 0.001$) were observed in patients who experienced delirium. According to the Richmond Agitation-Sedation Scale (RASS), patients with delirium had significantly higher scores for postoperative pain (6.4 ± 1.3 vs. 3.5 ± 1.2, $p < 0.001$) and significantly lower levels of severe sedation (-0.8 ± 0.5 vs. -1.8 ± 0.6, $p < 0.001$). At 65.2% and 45.5%, respectively, both groups used propofol, and at 34.8%

and 54.5%, respectively, both groups used dexmedetomidine, both at equal rates (p = 0.09). Delirium following cardiac surgery is more common in older, heavier, hypertensive, and surgically involved patients, according to the statistics.

Table 4. 5 Comparison of delirium among two groups

Variable	Delirium Present (n=23)	Delirium Absent (n=77)	p-value
Age (years)	68.4 ± 6.8	60.2 ± 8.5	<0.001*
Gender			
Male (%)	15 (65.2%)	40 (51.9%)	0.25
Female (%)	8 (34.8%)	37 (48.1%)	
Body Mass Index (BMI, kg/m²)	28.7 ± 3.4	26.1 ± 4.2	0.02*
Diabetes Mellitus (%)	14 (60.9%)	32 (41.6%)	0.09
Hypertension (%)	16 (69.6%)	35 (45.5%)	0.04*
Chronic Kidney Disease (%)	5 (21.7%)	6 (7.8%)	0.05*
Duration of Surgery (minutes)	178.3 ± 25.6	145.7 ± 30.1	<0.001*
ICU Stay (days)	5.1 ± 2.3	2.8 ± 1.7	<0.001*
Length of Hospital Stay (days)	12.7 ± 4.5	8.4 ± 3.2	<0.001*
Postoperative Pain Score (VAS)	6.4 ± 1.3	3.5 ± 1.2	<0.001*
Sedation Level (RASS)	-0.8 ± 0.5	-1.8 ± 0.6	<0.001*
Use of Dexmedetomidine (%)	8 (34.8%)	42 (54.5%)	0.09
Use of Propofol (%)	15 (65.2%)	35 (45.5%)	0.09

There were some disparities between the propofol and dexmedetomidine groups in terms of ICU expenditures. The group that got propofol had sedative medicine

expenses of 600 ± 150 USD, while the group that got dexmedetomidine had considerably higher costs (750 ± 200 USD) with a p-value less than 0.001. In comparison to the dexmedetomidine group, the propofol group spent 300 ± 80 USD more on analgesic medicines (p = 0.03). In comparison to the propofol group (100 ± 50 USD, p = 0.01), the dexmedetomidine group had a far lower cost of antipsychotic drug at 70 ± 30 USD. Lab and imaging costs, together with other critical care unit charges, were marginally lower in the dexmedetomidine group (1,100 ± 300 USD) than in the propofol group (1,200 ± 350 USD, p = 0.07). When comparing the total intensive care unit (ICU) costs (8,500 ± 2,500 USD for the propofol group and 8,000 ± 2,100 USD for the dexmedetomidine group; p = 0.15), there was no notable difference between the two groups. Despite differences in the cost of certain medications, the total cost of the critical care unit remained similar across the groups, as shown by the figures.

Table 4. 6 Post operative variables comparison among group

Cost Component (USD)	Propofol Group (n=50)	Dexmedetomidine Group (n=50)	p-value
ICU Stay (Cost per Day)	1,200 ± 300	1,100 ± 250	0.08
Total ICU Stay Cost	4,800 ± 1,500	4,400 ± 1,200	0.09
Sedation Medication Cost	600 ± 150	750 ± 200	<0.001*
Analgesia Medication Cost	300 ± 80	250 ± 90	0.03*
Antipsychotic Medication Cost	100 ± 50	70 ± 30	0.01*
Nursing and Monitoring Costs	1,500 ± 400	1,400 ± 300	0.12
Other ICU Costs (Lab, Imaging, etc.)	1,200 ± 350	1,100 ± 300	0.07
Total ICU Costs	8,500 ± 2,500	8,000 ± 2,100	0.15

CHAPTER 5

DISCUSSION

The largest prospective randomised clinical trial to date found that postoperative sedation with dexmedetomidine, as opposed to propofol, reduced delirium in elderly patients after cardiac surgery. When administered as a sedative with dexmedetomidine, POD was less prevalent, began later, and lasted less (12,13). One delirium occurrence is prevented for every eight patients with a dexmedetomidine-based sedative strategy, which reduces the absolute risk for POD by 14% and has a number needed to treat of 7.1. Furthermore, this approach led to significant savings in expenditure, mostly as a consequence of the diminished frequency and length of POD (14-16). The dexmedetomidine group fared better for delirious patients, with a median difference of 8.7 hours in intensive care unit length and 2.5 days in hospital duration of stay. Last year, delirium accounted for an additional nine thousand days of hospitalization, costing University Health Network $17 million. If dexmedetomidine were used instead of propofol during cardiac surgery, patients might save around $2,613 USD each patient, according to Thoma et al. These results are critical for effective budget management in the current age of constrained resources and cost control (17-19).

Treatments for postoperative sedation have progressed to provide a more effective combination of hypnotic and analgesic sedation. As long as it is done promptly after surgery or during transport to the intensive care unit, extubation can be safely performed on certain patients having cardiac surgery without anesthesia. Sedation and artificial ventilation may be necessary for patients with several comorbidities undergoing high-risk heart surgery. For nearly a decade, propofol has been the standard for postoperative anesthesia following heart surgery (20,21), but dexmedetomidine offers a compelling alternative. Dexmedetomidine does not lead to respiratory depression, unlike other sedatives frequently used to severely sick patients. It also reduces anxiety, is calming, and acts as an analgesic. Dexmedetomidine also helps critically sick people sleep better, with a pattern similar to nonrapid eye movement sleep. Its substantial capacity to preserve opioids is further demonstrated by its role as an agonist for the α2-adrenergic receptor (22-24). On top of reducing CPB's inflammatory response, dexmedetomidine has no anticholinergic effects that are clinically relevant. The unusual combination of these features in dexmedetomidine

may have played a role in the decreased occurrence and length of POD. It is not surprising that dexmedetomidine, when administered during the perioperative phase, is associated with a decreased risk of mortality following heart surgery.

Finding out what causes postoperative nausea and vomiting (POD) following heart surgery was the primary goal of this research. Regardless of their significance level in the first investigation, we just utilized multivariate data and accounted for risk factors. Thirteen prospective cohort studies involving 14,847 patients were included in our review. When it came to postoperative nausea and vomiting (POD), we looked at nine potential causes. Other systematic reviews have incorporated risk factors from univariate regression or used other study designs, which may have affected the trustworthiness of the results. This is why we have detected less risk factors compared to them. Our findings underscore the urgency of conducting elective cardiac procedures without delay, since the risk of postoperative complications (POD) rose with each passing year of age. The likelihood of postoperative depression (POD) was further elevated when postoperative AF occurred and pre-operative depression was present. Our study also found that being older (≥65 years), having pre-operative atrial fibrillation, diabetes mellitus, having combined coronary artery bypass grafting and valve surgery, and every additional minute of continuous positive pressure (CPB) time are significant risk factors for postoperative complications. Findings of postoperative complications following heart surgery differ throughout research. Part of the reason for this is that surgical methods and population sizes vary among locations. Consistent with our findings, age, diabetes, and pre-operative depression are three of the most often reported risk factors for postoperative complications following heart surgery. When it came to the three risk factors discussed earlier, our results were similar to those of the study by Chen et al. Due to their limited focus on risk variables resulting from elective surgery and their failure to include some current papers in their evaluation, the authors failed to discover certain risk factors that we had uncovered. In contrast, because our analysis did not incorporate risk factors arising from univariate analysis, we did not discover all of the risk factors for POD that were found in that review. Ignoring the three risk variables listed earlier and AF, which were also found in the meta-analysis by Lin et al., which had somewhat different findings. The study in question is rather old, it only covers on-pump surgery, and it uses a mix of retrospective and prospective cohorts along with randomized controlled trials, which is why there is a disparity. Next, we'll go into more detail about how these three risk

factors contribute to an increased likelihood of POD(26–28). The aging process is believed to increase the risk of delirium in older people due to the processes that lower the brain's functional reserve. These processes include changes like protein overload, micro-infarcts or micro-bleedings, or disruption of the blood-brain barrier, as well as decreases in neural connections, synapses, and cerebral blood flow. Evidence suggests that neuropathy, inflammation, and damage to the blood-brain barrier can all be brought on by diabetes. Research suggests that depression can increase the risk of delirium in some people by influencing their stress and inflammatory responses, disrupting their circadian rhythm, increasing cortisol levels, and changing monoamine neurotransmission. Research like ours is crucial in identifying predisposing risk factors for cardiac patients since, unlike aging, many conditions can be prevented or better managed. Although being 65 or older was associated with an increased risk of polycystic ovary syndrome (PODS), our subgroup analysis revealed no difference in the association between increasing age and POD risk between the groups whose mean ages were 65 or older and those whose ages were younger. This provides more evidence that the processes linked to an increased incidence of POD in the elderly are separate from those inherent to the aging process. Subgroup studies also showed that gender and average age had little to no effect on the POD risk factors of pre- and post-operative depression, as well as on the risk factors of POD themselves(32,34).

Having hypertension did not increase the risk of postoperative nausea and vomiting (PODS) after heart surgery, though. The results of the meta-analysis conducted by Chen et al. are in line with this discovery. This might be because Krzych et al. found the exact reverse in their study, which included a much larger group. As a result, this will be an area that future studies with bigger samples can better assess(36).

Several strengths of this study stand out. To start, we made sure not to miss any relevant research by using a thorough search approach that included a plethora of related keywords. Secondly, in order to make strong inferences from consistent and reliable studies, we only included prospective cohorts in our inclusion criterion. Thirdly, the dependability of our findings was enhanced because the included studies were of excellent quality. Fourth, we did not extract any data from univariate regression, which is different from past investigations. Fifth, even though several of the risk factors were found to have no meaningful relationship to the development of POD, we nonetheless aggregated their impact estimates via multivariate regression(40,43).

This review is not without its own set of restrictions, though. To start, we may have missed some important data because we restricted our assessment to prospective cohorts, a decision we think was essential. Also, in order for risk factors to be considered, they needed to have been assessed in three separate studies that used multivariate analysis. This could be a drawback because it requires multiple regression to determine for sure if the effect for each risk factor is due to confounding factors or not. Therefore, the authors' subjective choice of which factors to include in the multiple regression analysis is largely responsible for identifying a risk factor as an independent risk factor for POD(49,55,65). Finally, it is still unclear if the variables listed as risk factors for POD—such as the duration of an intensive care unit stay, the use of mechanical ventilation, the kind of anesthetics used, the patient's fragility, and the need for emergency surgery—are independent risk factors in and of themselves. Further research utilizing multivariate regression to elucidate the impact of these risk factors is encouraged in further studies. Lastly, it is quite probable that publication bias has an impact on the results of post-operative AF. Hence, a bigger sample size should be considered for this outcome's evaluation. A number of our outcomes, such as age, HTN, the length of time since CPB, and combined CABG and valve surgery, showed a great deal of statistical variability. Nevertheless, the cause of this variability in results was found when numerous subgroup studies were conducted. Fifth, there was evidence of methodological heterogeneity across the studies that used the same diagnostic methods to find outcomes such pre-operative delirium, diabetes, and depression (51,52,58,59,65).

CONCLUSION

In summary, the postoperative use of a dexmedetomidine-based sedation protocol led to a decreased incidence, postponed onset, and shorter duration of postoperative delirium compared to a propofol-based sedation in elderly patients following heart surgery.

LIMITATIONS

- As a cross-sectional study, the design limits the ability to establish causal relationships between the type of sedation and the incidence of postoperative delirium. Longitudinal or randomized controlled trial designs would be more robust in this context.
- Patient selection may have introduced bias, particularly if allocation to dexmedetomidine or propofol sedation was not randomized or was influenced by clinical judgment or patient characteristics.
- The study may be underpowered to detect small differences in outcomes, especially if subgroup analyses (e.g., age, comorbidities) were conducted without adequate sample stratification.
- Delirium was assessed at a single time point or within a limited timeframe, potentially missing cases that occurred later during recovery. Furthermore, the accuracy of delirium assessment may depend on the tools used and the expertise of the evaluators.
- Although efforts were made to control for confounders, residual confounding from factors such as pain management, sleep disruption, and pre-existing cognitive impairment cannot be ruled out.
- If conducted in a single center, the generalizability of findings to other institutions or patient populations may be limited.
- The study did not assess long-term cognitive outcomes or mortality, which are important in evaluating the broader impact of sedation strategy.

RECOMMENDATIONS

- Dexmedetomidine may be preferred over propofol for sedation in postoperative cardiac surgery patients, especially in those at high risk for delirium, due to its potential neuroprotective and delirium-sparing effects.
- Standardized and routine delirium screening using validated tools should be incorporated into postoperative care to ensure early identification and management.
- Future studies should adopt randomized controlled designs to more definitively establish causality between sedation type and delirium outcomes.
- Conducting multicenter studies would enhance generalizability of the results across different patient populations and healthcare settings.
- Research should include long-term follow-up to assess the impact of sedation strategy on cognitive function, hospital readmissions, and quality of life.
- Hospitals should develop and adhere to sedation protocols that consider not only the type of sedative used but also factors like dosage, duration, and monitoring for adverse effects.
- Healthcare staff, especially in cardiac ICU settings, should receive ongoing education and training in delirium prevention, recognition, and management strategies.

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APPENDICES

APPENDIX-I

CONSENT FORM

Dexmedetomidine versus Propofol Sedation Reduces Delirium After Cardiac Surgery: A Cross-Sectional Study.

The purpose of this study is to evaluate and compare the effectiveness of Dexmedetomidine and Propofol in reducing the incidence of delirium in patients following cardiac surgery. By participating, you will be helping to advance our understanding of the best practices for managing sedation in cardiac surgery patients, potentially improving outcomes for future patients. If you agree to participate, you will be randomly assigned to receive either Dexmedetomidine or Propofol for sedation during your cardiac surgery. The selection of the medication will be done according to the study protocol. During and after your surgery, your condition will be closely monitored by healthcare professionals, with a specific focus on observing any signs of delirium. Your participation will involve no additional procedures beyond what is normally required for your surgery and postoperative care. Both Dexmedetomidine and Propofol are widely used and considered safe for sedation in cardiac surgeries. While you may not experience direct benefits from participating in this study, the information gathered may help improve sedation practices in cardiac surgeries and reduce the incidence of delirium in future patients. Your participation could contribute to enhancing overall patient care.Your privacy will be protected throughout the study. All personal information and data collected during the study will be kept confidential and stored securely. Results from the study may be published, but your identity will not be disclosed.

Consent:

By signing below, you acknowledge that you have read and understood the information provided, had the opportunity to ask questions, and voluntarily agree to participate in this study.

Participant's Name: _____

Participant's Signature: _____

Date: _____

Principal Investigator's Name: _____

Principal Investigator's Signature: _____

Date: _____

URDU VERSION

ڈیکس میڈیٹومیڈین بمقابلہ پروپوفول سیڈیشن کارڈیک سرجری کے بعد ڈیلیرئیم کو کم کرتا ہے: ایک کراس سیکشنل مطالعہ

اس مطالعے کا مقصد یہ جانچنا اور موازنہ کرنا ہے کہ ڈیکس میڈیٹومیڈین اور پروپوفول کارڈیک سرجری کے بعد مریضوں میں ڈیلیرئیم (ذہنی الجھن) کی شرح کو کم کرنے میں کتنے مؤثر ہیں۔ اس مطالعے میں حصہ لے کر آپ کارڈیک سرجری کے مریضوں کی بہتر دیکھ بھال کے لیے سیڈیشن (بے ہوشی کی دوا) کے بہترین طریقوں کی سمجھ کو بہتر بنانے میں مدد فراہم کریں گے، جو مستقبل کے مریضوں کے نتائج کو بہتر بنا سکتی ہے۔

اگر آپ اس مطالعے میں حصہ لینے پر رضامند ہیں، تو آپ کو بے ترتیب طور پر یا تو ڈیکس میڈیٹومیڈین یا پروپوفول دوا کے گروپ میں شامل کیا جائے گا، جو آپ کی سرجری کے دوران بے ہوشی کے لیے استعمال کی جائے گی۔ دوا کا انتخاب مطالعے کے طریقہ کار کے مطابق کیا جائے گا۔ آپ کی سرجری کے دوران اور بعد میں، صحت کے ماہرین آپ کی حالت کا بغور مشاہدہ کریں گے، خصوصاً ڈیلیرئیم کی کسی بھی علامت پر توجہ دی جائے گی۔

اس مطالعے میں حصہ لینے کے لیے آپ سے کسی اضافی طبی عمل کی ضرورت نہیں ہوگی، سوائے اُن کے جو عام طور پر آپ کی سرجری اور بعد ازاں نگہداشت کے لیے کیے جاتے ہیں۔ ڈیکس میڈیٹومیڈین اور پروپوفول دونوں ہی کارڈیک سرجری میں سیڈیشن کے لیے وسیع پیمانے پر استعمال ہوتی ہیں اور محفوظ سمجھی جاتی ہیں۔

اگرچہ ہو سکتا ہے کہ آپ کو اس مطالعے سے براہِ راست کوئی فائدہ نہ ہو، لیکن اس سے حاصل شدہ معلومات آئندہ کارڈیک سرجری کے مریضوں میں سیڈیشن کے طریقے بہتر بنانے اور ڈیلیرئیم کی شرح کو کم کرنے میں معاون ہو سکتی ہیں۔ آپ کی شرکت مجموعی طور پر مریضوں کی نگہداشت کو بہتر بنانے میں مدد دے سکتی ہے۔

مطالعے کے دوران آپ کی پرائیویسی کا مکمل خیال رکھا جائے گا۔ آپ کی ذاتی معلومات اور مطالعے کے دوران حاصل شدہ تمام ڈیٹا کو مکمل رازداری اور تحفظ کے ساتھ رکھا جائے گا۔ مطالعے کے نتائج شائع کیے جا سکتے ہیں، مگر آپ کی شناخت ظاہر نہیں کی جائے گی۔

:رضامندی

نیچے دستخط کر کے آپ تصدیق کرتے ہیں کہ آپ نے اوپر دی گئی معلومات کو پڑھا اور سمجھا، سوالات پوچھنے کا موقع ملا، اور آپ رضاکارانہ طور پر اس مطالعے میں حصہ لینے پر رضامند ہیں۔

_____ :شرکت کنندہ کا نام
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_____ :تاریخ

_____ :پرنسپل انویسٹیگیٹر کا نام
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_____ :تاریخ

APPENDIX -II

QUESTIONNAIRE

Section A: Demographic Information

1. Age: _____

2. Gender:

- [ ] Male
- [ ] Female

3. Weight (kg): _____

4. Height (cm): _____

5. Medical History (Check all that apply):

- [ ] Hypertension
- [ ] Diabetes Mellitus
- [ ] Chronic Kidney Disease
- [ ] Chronic Obstructive Pulmonary Disease (COPD)
- [ ] Previous Cardiac Surgery
- [ ] Other (please specify): _____

Section B: Preoperative Assessment

6. Type of Cardiac Surgery:

- [ ] Coronary Artery Bypass Grafting (CABG)
- [ ] Valve Replacement/Repair
- [ ] Aortic Surgery
- [ ] Other (please specify): _____

7. Preoperative Cognitive Status (Mini-Mental State Examination (MMSE) Score):

_____

8. Current Medications: (List all) _____

Section C: Intraoperative Data

9. Duration of Surgery (hours): _____

10. Intraoperative Complications (if any): _____

Bypass time _____

Section D: Postoperative Sedation and Monitoring

11. Assigned Sedative:
    - [ ] Dexmedetomidine
    - [ ] Propofol
12. Initial Loading Dose:
    - Dexmedetomidine: _____ µg/kg
    - Propofol: _____ mg/kg
13. Maintenance Dose:
    - Dexmedetomidine: _____ µg/kg/hr
    - Propofol: _____ mg/kg/hr

Section E: Sedation Level Assessment (Richmond Agitation-Sedation Scale - RASS)

(To be recorded every 4 hours during the first 24 hours post-surgery, then every 8 hours)

| Time Post-Surgery | RASS Score |

- 4 hours
- 8 hours
- 12 hours
- 16 hours
- 20 hours
- 24 hours
- 32 hours
- 40 hours
- 48 hours

Section F: Delirium Assessment (Confusion Assessment Method for the ICU - CAM-ICU)

(To be recorded every 8 hours for the first 5 days post-surgery or until ICU discharge)

Time Post-Surgery | CAM-ICU (Positive/Negative) |

- 4 hours
- 8 hours
- 12 hours
- 16 hours
- 20 hours
- 24 hours
- 32 hours
- 40 hours
- 48 hours

Section G: Outcomes

14. Duration of ICU Stay (days): _____
15. Duration of Hospital Stay (days): _____
16. Sedation-related Complications
    - [ ] Hypotension
    - [ ] Bradycardia
    - [ ] Respiratory Depression
    - [ ] Other (please specify): _____

APPENDIX -III

ETHICAL APPROVAL

SUPERIOR UNIVERSITY

OFFICE OF THE DEAN-FAHS

Ref.: IRB /FAHS/Allied-HS/10/24/MS/RS-3526

Date: 29th October 2024

Name: Nouman Ahmad (MS Allied Health Sciences)

Registration: SU91-MSAHW-S23-117

Subject: Ethical Approval Letter

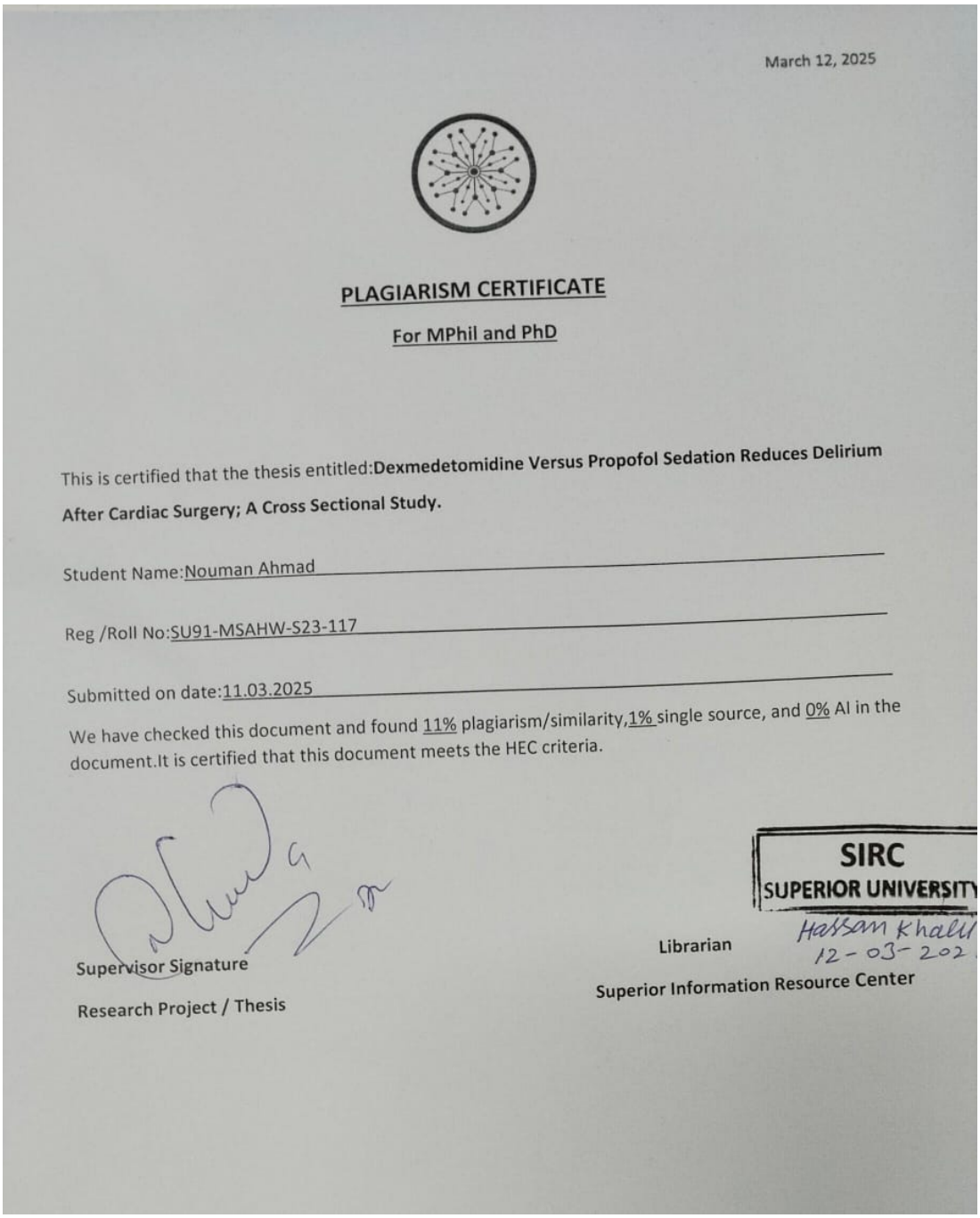
The Research Ethical Committee convened on Dated: **17th October, 2024** to discuss your protocol titled "**Dexmedetomidine versus propofol sedation reduces delirium after cardiac surgery; A cross sectional study**"

No further corrections and recommendations were suggested. The above-mentioned protocol has been approved after considering various research issues including ethical concerns with condition that the researcher will submit completion report at the end of his/her research.

Prof. Dr. Muhammad Naveed Babur
Dean/Convener REC
Faculty of Allied Health Sciences
Superior University, Lahore

APPENDIX -IV

PLAGERISM CERTIFICATE



March 12, 2025

PLAGIARISM CERTIFICATE

For MPhil and PhD

This is certified that the thesis entitled:**Dexmedetomidine Versus Propofol Sedation Reduces Delirium After Cardiac Surgery; A Cross Sectional Study.**

Student Name:Nouman Ahmad

Reg /Roll No:SU91-MSAHW-S23-117

Submitted on date:11.03.2025

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