Adequacy of pain relief following cardiac surgery and factors which aid in its effective management.

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ABSTRACT-
Background- Pain post cardiac surgery is one of the many debilitating complications of surgery which has a high chance of turning chronic.The aim of the study was to assess the pain satisfaction of the patients and evaluate the various factors that aid in its effective management.
Design and Methods- A correlation study was conducted among inpatients at ******************, who were undergoing CABG (coronary artery bypass surgery), Atrial septal defect and Valve replacement surgery. The pain score of the patients was noted using the Visual Analog Scale (VAS) at two intervals, 6 hours and 12 hours post the surgery. The analgesics the patients received for their pain management were recorded to help assess their effectivity in the pain management of the patients.
Results- 77.4% (55) of the patients were prescribed paracetamol IV, 100ml, 1000mg. 49.2% (35) patients were given dexmedetomidine injection 0.2-0.7 mcg/kg. 36.6% (26) of the patients were given fentanyl 25 mcg. The mean pain score at the 6-hour interval was found to be 4.71 (±3.03). 12 hours post-surgery, the mean pain score of all the patients was found to be 2 (±2.64).
Conclusion-This study showed that the number of patients satisfied with their pain management post cardiac surgery was 33.8% (24), 6 hours post the surgery and 78.9% (56) 12 hours post the surgery in Chennai at. The patients were given three analgesics (paracetamol IV, Dexmedetomidine inj. And fentanyl 25mcg) in various different combinations to achieve this result.
Key-words- Pain management, pain score, cardiac surgery, Visual Analog scale.

I.   INTRODUCTION
One of the major and common symptoms following cardiac surgery is pain due to a variety of different reasons. Especially during cardiovascular and respiratory complications, high pain in the patients is seen. These reasons however are mostly avoidable but still not efficiently and adequately managed in most patients. Some of the main reasons for this inadequate management of pain is poor reporting of pain and strong side effects of some analgesics[1]. This led me to not just look into the aggravating and relieving factors but also understand the mechanisms for a more holistic and complete management. A critical part of the study is the post-operative pain score of the patients. This is a numeric rating scale (0-10) where 0 is no pain and 10 is the worst pain imaginable [2]. This scale will help us in identifying the patients who are in need of pain management and are not adequately treated for pain compared to those who are more properly handled. This will also help us correlate through the study the factors which are seen in better care of the patients as well as the factors which are more likely not as effective or useful in efficient management [3]. Pain as an entity is highly detrimental in a variety of ways for the patients which also is a reason why this research project is of high importance for the medical community. Pain in the patients is seen in many different scenarios in the patients. Deep breathing, movements and coughing are some of the activities which cause excessive pain in the patients[4].

Apart from an increase in the chances of the patient developing atelectasis, pain also increases adrenaline secretion which increases heart rate and blood pressure leading to a higher incidence of arrhythmias, atrial fibrillation (AF), and increase myocardial oxygen consumption, leading patients to ischaemic events [5]. Apart from the above, pain also causes anxiety and stress leading to a decreased amount of sleep and an adverse effect on patient mood [6]. All the above factors can eventually lead to depression as

well. Coronary artery bypass graft surgery (CABG) was first performed in India in 1975, this was 13 years after its arrival in 1962. By the mid-1990s some 10,000 CABG surgeries were being performed in the country each year. This number has now increased to 60,000. The main reasons why there is this increase in the number of patients requiring and receiving CABG are sedentary lifestyle, high incidence of smoking and diabetes, atherogenic dyslipidaemia and unhealthy eating habits [7]. This increase in cardiac surgery is another important reason for better post-operative cardiac surgery management in the ever-increasing patient population [8].

II.   MATERIAL AND METHODS

Study population: After informed written consent, post-operative adult inpatients at ******************who underwent CABG (coronary artery bypass surgery), Atrial septal defect and Valve replacement surgery, meeting the inclusion and exclusion criteria will be taken in the study.

Inclusion Criteria:
1.   Adults aged 18 -85 years
2.   Undergoing cardiac surgery
3.   Inpatients at ***************

Exclusion criteria:
1.   Patients unwilling to participate in the study
2.   Patients with psychiatric comorbidities
3.   Patients on pain medications prior to surgery.

Sample size: 71, patients based on prevalence of 70.5% from previous studies.
Desired confidence level=95%
Relative precision=15%
(Mohammadreza Sattari et al Study of Patient Pain Management after Heart Surgery Adv Pharm Bull. 2013 Dec; 3(2): 373–377.)

Study design: 1. Correlation study for assessing the positive and negative factors in the efficacious management of post-operative pain.
2. The pain score for the study will be taken twice for each patient for a more thorough assessment. One reading will be taken after 6 hours and another will be taken after a 12-hour duration. In this period all the various analgesics used by and prescribed to the patients will be noted.
3. The intraoperative analgesic will also be noted. This in all cases will be either a regional anaesthesia or only IV Fentanyl.
4. The way the research data will be correlated is that first the average pain score in the patients will be noted. After that all the various drugs used in the

patients will be classified according to their presence and absence in the patients. This will be with regard to the number of times they feature in patients with above or below average pain scores. This will help identify the more efficacious and less efficacious forms of treatment.

Study tools:
Data will be collected in terms of the pain score of the patients. This will serve as the key determinant in helping identify the best and most efficacious treatment method. The Mini International Neuropsychiatric Interview (Mini 6.0) will be used to exclude patients with psychiatric comorbidities.
(All COVID-19 protocols were followed strictly while conducting the research)

III.   RESULTS

71 randomly chosen patients were selected for the research. All patients met the inclusion criteria for this research and underwent cardiac surgery in**************, Chennai, India. The mean age of the patients was found to be 54.22(±14.38).70.4% (50) of the patients, in the study, were male, 29.6% (21) were female. All the patients were from Tamil Nadu, predominantly residing in Chennai. The main surgery the patients underwent was Coronary Artery Bypass Graft (CABG). 78.8% (56) of the patients underwent CABG, 14% (10) underwent surgery for atrial septal defect correction, 4.2% (3) patients underwent mitral valve replacement, and 3% (2) aortic valve replacement (Table 1). All the patients selected were not taking any pain medication before the surgery. All the patients underwent surgery under general anaesthesia.

Table 1- surgery undergone by the patients in the study
After surgery, all the patients were prescribed at least 1 analgesic to combat the pain. All the pain medications given to the patients in the post-operative period were given through Intravenous route, considering the nil per oral status (NPO status). 77.4% (55) of the patients were prescribed paracetamol IV, 100ml, 1000mg. 49.2% (35) patients were given dexmedetomidine injection 0.5 mcg/kg. 36.6% (26) of the patients were given fentanyl 25 mcg (Table 2). Of these medications, 40.9% (29) of patients received only one medication. 54.9% (39) received two of the medications and 4.2% (3) patients received all three medications, these were given depending on the patient satisfaction and pain score (Table 3).

Table 2- Analgesics received by patients

Table 3- Number of drugs received by the patients

According to the Visual Analog Scale (VAS), which ranges from 0 to 10, the mean pain score of all the patients, 6 hours post-surgery was found to be 4.71 (±3.03). 12 hours post-surgery, the mean pain score of all the patients was found to be 2 (±2.64). The pain medications prescribed to the patients were selected as per the expertise of the doctor handling the particular case. Additional analgesics were prescribed when the pain score was above satisfactory level(VAS of above 4). In the study, 33.8% (24) of the patients reported satisfaction with pain management, 6 hours post-cardiac surgery. 78.9% (56) of the patients reported satisfaction with pain management 12 hours post-cardiac surgery.

Figure-1 Mean pain score of patients

The patients were divided into groups based on a number of drugs received and these were correlated. No significant difference was found between these groups (p value=0.787) (Table 4).

The patients were also divided into groups based on the analgesic/analgesics (drugs taken) received by the patients and these were correlated. No significant difference was found between these groups (p value=0.704) (Table 4).

Table 4- Significance of data

IV. DISCUSSION

Chronic post operative pain has many negative impacts and these impacts are seen to last even a year after the surgery. One-third of patients who reported chronic pain were also suffering from sleep disturbances. In some cases of patients over 60 years of age, the pain has been reported to be seen even 28 months post-surgery, with a frequency of 40% (19). This is one of the many reasons why research is required in this field of pain management in post-surgery patients.

The pain score in the present study was seen to decrease significantly between 6 hours and 12 hours post-surgery, from a mean of 4.71 to a mean pain score of 2. In the study conducted in Brazil by Érica Vieira de Andrade et al, the mean pain score was also seen to decrease from 2.6 to 2.4 between the first 24 hours and 24-48 hours post-cardiac surgery.

The main cardiac surgeries undergone by the patient's part of the present study were 78.8% CABG, 14% atrial septal defect surgery, and 7.2%

valve replacement. In the study conducted Mohammadreza Sattari et al in Tabriz, East Azerbaijan, the main cardiac surgeries part of the study was 62.5% CABG, 12.5% valve repairment, and 25% others.

In the present study, the analgesics prescribed were paracetamol IV to 77.4% of the patients, dexmedetomidine to 49.2% of the patients, and fentanyl (opioid) to 36.6% of the patients. In the study conducted by Mohammadreza Sattari et al in Tabriz, East Azerbaijan, the main analgesics used were acetaminophen codeine (57.8%), acetaminophen (19.1%), ibuprofen (11.9%), and opium (2.4%).

Patient satisfaction in the present study was found to be 78.9% 12 hours post-surgery. In the study conducted by Mohammadreza Sattari et al in Tabriz, East Azerbaijan, the patient's satisfaction was found to be 80% post-cardiac surgery which is very similar.

This study showed that the number of patients satisfied with their pain management post cardiac surgery was 33.8% (24), 6 hours post the surgery and 78.9% (56) 12 hours post the surgery in Chennai at***************. The patients were given three analgesics (paracetamol IV, Dexmedetomidine inj. And fentanyl 25mcg) in various different combinations to achieve this result.The mean pain score of all the patients, 6 hours post-surgery was found to be 4.71 (±3.03). 12 hours post-surgery, the mean pain score of all the patients was found to be 2 (±2.64). The pain score was vital in helping determine the pain satisfaction of the patients in the study

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Tables

Table 1- surgery undergone by the patients in the study

Surgery undergone	Coronary artery bypass graft (CABG)	Atrial septal defect correction	Mitral valve replacement	Aortic valve replacement
Number of patients	56 (78.8%)	10 (14%)	3 (4.2%)	2(3%)

Table 2- Analgesics received by patients

Analgesic received by patients	Paracetamol Iv	Dexmedetomidine inj.	Fentanyl 25mcg
Number of patients	55(77.4%)	35(49.2%)	26(36.6%)

Table 3- Number of drugs received by the patients

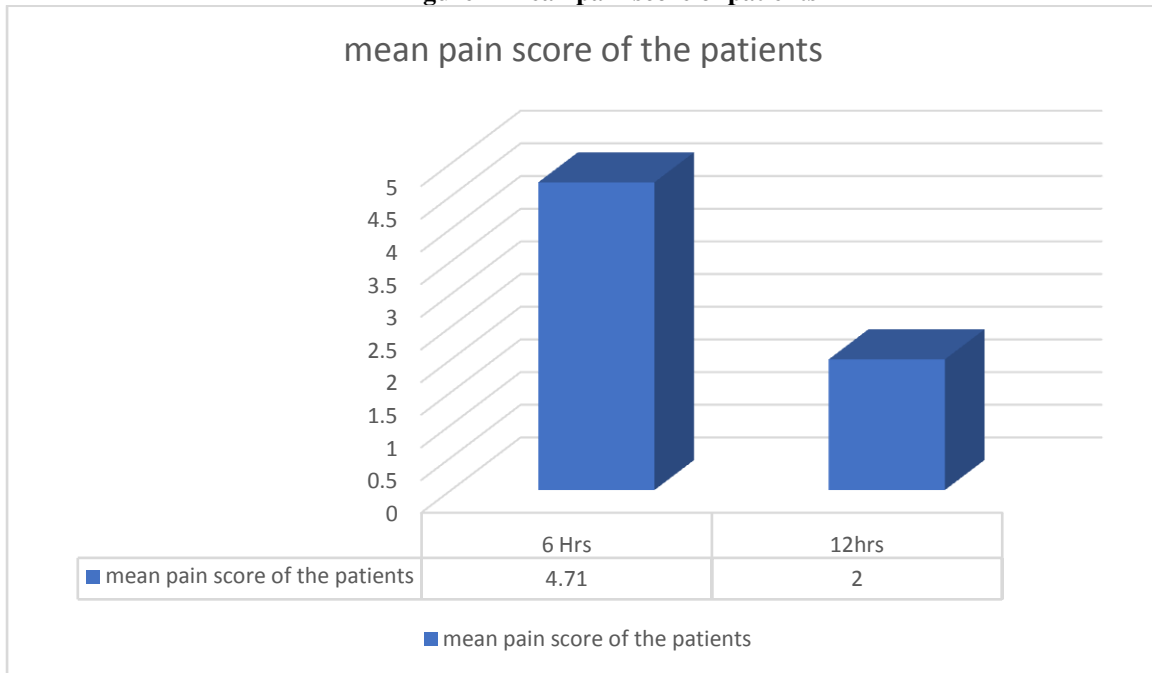| Number of drugs	1	2	3
Number of patients	29(40.9%)	39(54.9%)	3(4.2%)

Table 4- Significance of data

				Mean Square	F	Sig.
Number of drugs	Between Groups	(Combined)		0.176	0.525	**0.787**
		Linear Term	Weighted	0.205	0.612	0.437
			Deviation	0.170	0.507	0.770
	Within Groups			0.335		
	Total					
Drugs taken	Between Groups	(Combined)		2.254	0.632	**0.704**
		Linear Term	Weighted	2.805	0.787	0.378
			Deviation	2.143	0.601	0.699
	Within Groups			3.563		
	Total					

Figures

Figure-1 Mean pain score of patients

Figure-1 Mean pain score of patients

Legends
Table 1- surgery undergone by the patients in the study
Table 2- Analgesics received by patients
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