

Influence of Preoperative Anxiety Level on Postoperative Pain After Cardiac Surgery

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Abstract

Introduction

Preoperative anxiety is generally neglected in evaluation of cardiac surgery patients due to various reasons including insufficient literature and lack of simple assessment tool. In addition, association between anxiety and postoperative complications including pain has been scarcely studied. Present study was designed, to assess preoperative anxiety levels in all patients coming for cardiac surgery and then evaluate the effect of different levels of anxiety on postoperative pain scores.

Methods

This prospective cohort study was conducted in a single university hospital, from March 2018 to December 2019. 100 consecutive cardiac surgery patients between the ages of 18-65 year were enrolled in this study. Level of preoperative anxiety (assessed by State Anxiety Inventory) and its effect on postoperative pain and morphine consumption was assessed.

Results

The average age of the patients was 58.24 ± 10.03 year in which 68% were male and 32% female. Preoperative mild anxiety was observed in 64% patients and moderate to severe anxiety in 36% patients. Post-operative mean pain score was significantly high in moderate to severe anxiety group as compared to mild anxiety group [Mean pain difference =1.64 (95%CI: 1.38-1.89) $p=0.0005$], [Mean pain difference =0.51 (95%CI: 0.29-0.73) $p=0.0005$] at 12 hour and 24 hour respectively. Intraoperative and postoperative morphine consumption was significantly high in patients with moderate to severe anxiety group.

Conclusions

Patients with moderate to severe anxiety before cardiac surgery experienced higher pain scores at post-operative period which is significantly different from mild anxiety group. Intraoperative and postoperative analgesic requirements were also significantly increased.

Introduction

Anxiety is defined as a negative or life threatening emotion that one feels generally in long term or in a specific situation, that fluctuates over time(1). Surgery and hospitalization are considered to be a major life change, causing anxiety regardless of type of surgery and disease(2). The degree to which each patient manifests anxiety depends on many factors, including age, gender, type and extent of proposed surgery, previous surgical experience and personal susceptibility to stressful environment and socioeconomic and ethnic background(3).

Heightened anxiety before surgery is associated with hypertension, dysrhythmias, refusal for surgery, exacerbation of coronary artery disease symptoms(4), slow wound healing, fluid and electrolyte

imbalance and increased risk of infection. It has also been linked to post-operative pain, impaired quality of life and increased morbidity and mortality (5, 6). Preoperative anxiety may have a role in the development of chronic postoperative pain but more studies are needed (7, 8). Reported incidence of preoperative anxiety ranges from 60–92% in unselected surgical groups and higher in females (9, 10). Nigussie et al. in 2012, found significant rate of preoperative anxiety (70.3%) among surgical patients(2). Anxiety prevalence is probably higher in cardiac surgical patients while on waiting list(11).

There are few studies which showed significant correlation between preoperative anxiety and postoperative pain(12–15). 30–80% of patients undergoing surgery suffer from inadequately treated pain and preoperative anxiety has seen to influence patients to experience more pain after surgery(16). Miguel et al in their study concluded that preoperative anxiety significantly increases postoperative pain and analgesic consumption in cardiac surgery patients(17).

State Anxiety Inventory (STAI) for Adult is an excellent tool for assessing anxiety. Reliability and validity of STAI are well reported. The STAI form (Y) is the definitive instrument for measuring anxiety in adults. The STAI form Y-6 consists of six statements that evaluate how the patient feels “right now” at this moment.

Pain is a subjective experience that is influenced by psychological, cultural, and other variables. The most common way to quantify pain is through self-reporting measures. A patient may describe pain intensity simply by indicating his pain on a scale. Most of these scales are unidirectional. These scales are simple and easy for the patients to use and understand and are relatively inexpensive.

Visual analogue scale (VAS) and numerical rating scales are commonly used scale to assess pain. Studies have shown good relation between the VAS and other measurements of pain intensity. In addition, it is easy to understand and reproducible over time. Numerical rating scale is used to determine the intensity of pain. Patients would be asked to rate their pain from “0” (no pain) to 10 number representing pain as intense as it could be. This scale is easy to administer, reliable and reproducible. Additionally, it is readily acceptable by the patient.

Generally, there is inadequate analysis of patient’s psychological status pre-operatively, which hinders appropriate measures to reduce patient’s anxiety. This issue needs to be addressed to reduce postoperative complications including pain.

Preoperative anxiety is generally neglected due to various reasons including, lack of knowledge, insufficient literature and lack of simple assessment tool. The results of this project may also be beneficial to the anaesthesia community and societies, by potentially heightening the awareness about preoperative anxiety and its effects where this is not typically considered. This awareness may lead to better prevention and readiness through the creation or improvement of policies, procedures, and trainings.

Present study was designed, to assess preoperative anxiety levels in all patients coming for cardiac surgery and then evaluate and compare with postoperative pain scores.

Material And Methods

This Prospective cohort study was conducted in preoperative area, ward & high dependency unit of Aga Khan University Hospital, Karachi. 100 consecutive patients between the ages of 18–65 year were enrolled in this trial. All patients coming for cardiac surgery and planned for fast track extubation were included. Emergency cardiac surgery patients and those who required reopening for bleeding were excluded from the study. Other excluded patients were, patients taking any antipsychotic or anxiolytics, Hypo or hyperthyroidism and Neurological or psychological disorder.

Ethics

Ethical approval of this study was provided by ethical committee of Aga Khan University, Karachi Pakistan (Chairperson Dr Shaista Khan) on 26th February, 2018. Reference # 5139-Ane-ERC-17.

Data collecting procedure

The study was conducted after approval from institutional ethical review committee (ERC). The duration of study was between March 2018 to December 2019. An informed written consent was taken night before surgery from all the patients scheduled to undergo elective cardiac surgery. A copy of the informed consent was given to the patient. The confidentiality of the patient and data was maintained by assigning a number for each patient data, electronic data was password protected and data on hard copies was kept in a lock and key.

Non-probability consecutive sampling technique was used. Those patients who fulfill the inclusion criteria were approached a night before surgery. Patients were assessed pre operatively by using the State Anxiety Inventory (STAI) scale for Adult. The STAI form Y-6 consists of six statements that evaluate how the patient feels “right now” at this moment. Primary investigator asked these questions and answers were noted in a proforma and scoring was done. Individuals with STAI score more than 40 were considered as moderate to severe anxiety and those having STAI score 40 or less were allocated mild anxiety group. These patients were approached after successful surgery and extubation. The post-operative pain was determined by using numeric pain scale at 12hr and 24hrs of surgery and total narcotic consumption was also noted along with duration of surgery, amount of intra operative and postoperative analgesia used. Pre-operative anxiety and post-operative pain assessment was done by primary investigator on predesigned data collection form.

Sample size calculation was based on previous study by Koivula et al. who reported the preoperative anxiety as 50% in coronary artery bypass graft surgery (CABG)(11). 100 patients were needed to estimate expected prevalence of preoperative anxiety within 10% margin of error with 95% confidence interval.

Data was analyzed by statistical packages for social science version 17 (SPSS Inc., Chicago, IL). Mean and standard deviation were estimated for quantitative variables like age, weight, height, BMI and STAI scores, duration of surgery, intraoperative analgesics used, postoperative opioid consumption and postoperative pain scores. The normality of the continuous data was tested by the Shapiro-Wilk test and by examining the equantile plot. Normally distributed continuous variables were presented as mean \pm SD and compared between the mild vs moderate to severe anxiety using a two-sample Student t test. When the distribution was not normal, the median along with first (Q25) and third quartiles (Q75) were presented, and a Mann Whitney U test was used. Frequencies and percentages were calculated for qualitative variables like gender, marital status, and type of surgery and analysed by chisquare or Fisher's exact test. Multivariable logistic regression analysis was run to observe the association of preoperative anxiety and pain score after controlling the effect of age, gender, type of surgery, diabetic and hypertension. P-value \leq 0.05 was considered significant.

Results

Total of 100 patients undergoing cardiac surgery (CABG or valvular surgery) were included in the study. The average age of the patients was 58.24 ± 10.03 year in which 68% were male and 32% female. Out of 100 patients, CABG was performed in 88% and rest were 12% (valvular surgery). Diabetes mellitus was observed in 55% and 70% were hypertensive.

Out of 100 patients preoperative mild anxiety was observed in 64% patients and moderate to severe anxiety in 36% patients. Demographic characteristics, type of surgery and duration of surgery were not statistically significant in patients with mild anxiety and moderate to severe anxiety groups (Table 1.) Post-operative mean pain score was significantly high in preoperative moderate to severe anxiety group as compared to mild anxiety group [Mean pain difference = 1.64 (95%CI: 1.38–1.89) $p = 0.0005$], [Mean pain difference = 0.51 (95%CI: 0.29–0.73) $p = 0.0005$] at 12hour and 24 hours respectively. Intraoperative and postoperative morphine consumption was significantly high in patients with moderate to severe anxiety group (Table 2).

Table 1
Demographic and other characteristics of patients (n = 100)

Variables	Mild Anxiety n = 64	Moderate to severe Anxiety n = 36	p-value
Age (years)	59.23 ± 9.75	56.47 ± 10.42	0.18
Weight (kg)	71.04 ± 12.63	65.56 ± 12.36	0.03
Height (cm)	162.11 ± 10.57	160.51 ± 9.87	0.46
BMI (kg/m ²)	27.27 ± 4.98	26.24 ± 4.15	0.31
Gender			
Male	45(70.3%)	23(63.9%)	0.51
Female	19(29.7%)	13(36.1%)	
Smoker	26(40.6%)	12(33.3%)	0.47
Co-Morbidity			
Hypertension	43(67.2%)	27(75%)	0.41
Diabetes Mellitus	31(48.4%)	24(6.7%)	0.08
Others	13(20.3%)	5(13.9%)	0.42
Type of surgery			
Valvular surgery	7(10.9%)	5(13.9%)	0.66
CABG	57(89.1%)	31(86.1%)	
Duration of surgery (min)	284.47 ± 37.32	286.25 ± 41.45	0.826

Table 2

Comparison of postoperative pain score and intra and postoperative analgesia in patients with mild and moderate to severe anxiety

Outcome	Mild Anxiety n=64	Moderate to severe Anxiety n=36	P-value
Pain at 12 hours	3.50±0.67 3[3-4]	5.14±0.54 5[4-5]	0.0005
Pain at 24 hours	1.38±0.49 1[1-2]	1.89±0.57 2[1-2]	0.0005
Intra-operative Analgesia morphine (mg)	12.78± 1.22 13[12-14]	13.81±1.72 14[13-15]	0.002
Post-operative analgesia Morphine (mg)	3.84±4.59	11.39±6.93	0.0005
Data are presented as mean ± Sd and Median[Q25-Q75]			
Mann Whitney U test was applied because data are not normally distributed.			

Multivariate analysis showed in Table 3, at 12 hours, the adjusted beta coefficient of preoperative moderate to severe anxiety was 1.71 [95%CI: 1.44 to 1.98] which demonstrated that on average postoperative pain score was significantly higher in patients with preoperative moderate to severe anxiety than those who had preoperative mild anxiety after controlling the age, gender, BMI, type of surgery and comorbid like diabetic and hypertension(Table 3). Similarly, at 24 hours magnitude of adjusted beta coefficient of preoperative moderate to severe anxiety was although lower than 12 hours but still statistically significant.

Table 3

Multivariable analysis by using General Linear Model showing the association of preoperative anxiety and pain score

Predictors	Pain at 12 hours			Pain at 24 hours		
	B(SE)	95%CI	P-value	B(SE)	95%CI	P-value
Anxiety						
Mild	Ref			Ref		
Moderate to severe	1.71(0.14)	1.44 to 1.98	0.0005*	0.52(0.11)	0.29 to 0.74	0.0005*
Age (Years)	-0.006(0.007)	-0.02 to 0.07	0.363	-0.002(0.01)	-0.013 to 0.009	0.75
Gender						
Male	0.09(0.14)	-0.18 to 0.36	0.518	0.17(0.11)	-0.05 to 0.40	0.12
Female	Ref			Ref		
BMI	0.007(0.01)	-0.02 to 0.03	0.519	0.002(0.01)	-0.02 to -0.017	0.841
Surgery						
Valvular surgery	Ref			Ref		
CABG	0.11(0.23)	-0.36 to 0.58	0.634	-0.47(0.19)	-0.86 to -0.09	0.016*
Diabetic Mellitus	-0.31(0.14)	-0.59 to -0.03	0.032*	-0.08(0.12)	-0.31 to 0.16	0.51
Hypertension	-0.13(0.15)	-0.43 to 0.17	0.412	0.02(0.13)	-0.23 to 0.27	0.86
Intercept	3.74(0.46)	2.81 to 4.66	0.0005	1.85(0.38)	1.09 to 2.61	0.0005
Pain score at 12 and 24 hours are dependent variables. Adjusted R Square = 0.626 and 0.28 for 12 hours and 24 hours respectively. B = Regression Coefficient; Se = Standard Error						

Discussion

Anxiety is a common disorder that involves feeling of extreme fear or worry. It has been observed that many patients undergoing surgery experience anxiety. It has positive relationship with intraoperative and postoperative complication. There are various tools designed for measuring anxiety and all those tools have some limitations, among them state trait inventory questionnaire is considered most reliable tool as it has shown consistent result in various studies. It is a sensitive predictor of distress over time.

The incidence of significant preoperative anxiety in our study population was 36% by using STAI scale. Miguel et al.(5) also found the incidence of 32% while in other studies it varies from 20–92%(2, 9, 18). This wide range may be due to the use of different scales in different surgical patients. Type of population may also influence the incidence of anxiety as higher percentages are seen in western population (11, 19).

Determinant of high preoperative anxiety in various studies are prolonged waiting time, age under 65 year(5), fear of anaesthesia and surgery, lack of information about procedure, fear of postoperative pain and distorted body image and separation from family. Better preoperative consultation has shown to reduce anxiety (20, 21).

In the present study, although insignificant but preoperative anxiety was more common in female cardiac surgery patients than male patients (40.6% vs 33.8%). This is in line with the study by Mehdi et al. who suggested that the preoperative anxiety levels are much higher in female than male patients (1). Vilma et al.(22) also found higher anxiety in females. Although, the percentage of female patients was very low in the present study and difficult to conclude but previous studies have also shown the same trend(9).

No significant differences were found between preoperative anxiety and smoking, DM, HTN and BMI. Type of surgery (Valvular vs CABG) also had no significant effect on anxiety. Valve surgery patients were slightly more anxious preoperatively in comparison with CABG surgery patients. This is in contrast with other studies where CABG patients showed higher anxiety scores (23). Reason may be that in our study only 12 patients underwent valve surgery and rest were CABG surgery patients.

Study by H. Kil et al in 2011 concluded that patients with higher STAI scores required greater amount of induction and inhalational agent and also significantly associated with post-operative pain (24). We did not look at induction agent and inhalation requirements but intraoperative analgesia requirements were increased in moderate to severe anxiety group. Rather, Intraoperative analgesia requirements in the present study were significantly higher in moderate to severe anxiety group. Takenkara Shiho et al. proposed that high preoperative anxiety is associated with reduced intraoperative nociceptive response (changes in HR, SBP and perfusion index) and high postoperative response(25). This may be the reason that intraoperative narcotic consumption was lower than expected in their study. Preoperative Anxiety may also effect the intraoperative haemodynamics. Aysegul Bayrak et al. noticed higher HR and Blood pressure in anxiety group than non-anxiety or lower anxiety score groups(26). Post-operative pain scores were also higher in anxiety group. Marentes et al. demonstrated higher anaesthetic requirements in anxiety group but analgesic requirements were not mentioned in their study(27). In fact we were unable to find any study showing intraoperative analgesia requirements. We need further studies to look at this factor as well.

In our study, using standard analgesia protocol post-operative pain scores were found significantly higher in moderate to severe anxiety group as compared to mild anxiety group in first 24 hrs. As expected, the analgesic requirements were also significantly increased in moderate to severe anxiety group. This may be due to the fact that average pain score was moderate in anxiety group and mild in non-anxiety during

first 12 hrs. Highly significant association was found when postoperative pain was compared between non anxious and anxious patients after adjusting age gender, type of surgery and other comorbidities. Our study is in line with study by Miguel et al. who measured preoperative anxiety and depression using, Hospital anxiety and depression scale (HADS) and found significant correlation of pre-operative anxiety with post-operative pain(5). Analgesic consumption was also high in their study in anxiety group and remain high for 48 hours after extubation.

Study by Gresztat et al. in 2008 concluded that patients with higher preoperative anxiety respond poorly to analgesic medication, which may be due to increase perception of pain(28). It is difficult to say whether preoperative anxiety leads to change in pain intensity or the response to pain medications disturbed.

Ocalan et al. looked at ENT surgeries and found a positive relationship of preoperative anxiety and post-operative pain, but negative relationship of post-operative pain with depression. They also suggested early intervention to relieve preoperative anxiety(29). Other studies also concluded with same suggestions in various surgeries(18, 30).

Generally, female patients have higher pain scores than men(31). In the present study, male patients showed slightly higher mean postoperative pain scores, irrespective of groups during first 24 hours as compared to females. But the association between gender and postop pain was insignificant. Postop morphine requirement was higher in female patients than male but this association was insignificant.

Pregabalin has been used as an anxiolytic agent before neurosurgery and authors were able to demonstrate the anxiolytic effect and reduced postoperative analgesic requirements(32). It shows that anxiolysis does reduce postoperative analgesia need.

Significant association was also found between type of surgery and postoperative pain at 24 hrs. where postop pain was more at valvular surgery than CABG after adjusting other factors.

Further studies are required to see the effect of preoperative anti-anxiety medication on postoperative pain management. These medications can be started on surgical floors, night before surgery and continued till patient called for operative room. In addition it is the responsibility of doctor and nurse to educate patients about the procedure, and also take appropriate interventions, in order to reduce anxiety and post-operative morbidities. Another approach is to give ICU tour to patient and families before surgery in order to improve satisfaction and reduce anxiety(33).

Average age of the anxiety group was non-significantly lower than non-anxiety group. But postoperative pain was not affected by age except in 51 to 60 years group. There was no change in analgesic requirements for pain control in both the groups despite higher pain scores in anxiety group.

Our study also found that patients of anxiety group having duration of surgery more than 300 minutes had greatest post-operative pain scores(5.00 ± 1.41) at 12 hrs. which is moderate by our definition. This is

significantly different for non-anxious patients who had mild pain at the same time but this difference abolished at 24 hrs.

The main limitation of the study was that the study was performed in only one centre and all factors responsible for anxiety were not considered

In conclusion, our study indicates that patients undergoing cardiac surgery and experienced moderate to severe anxiety before surgery are more prone to develop higher pain scores at post-operative period which is significantly different from mild group. Intraoperative and postoperative analgesic requirements were also significantly increased.

Declarations

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None declared

Author's contribution:

(Muhammad Kashif)MK: Data collection, writing the article,

(Mohammad Hamid)MH: Concept, writing the article, critical appraisal,

(Amir Raza)AR: Statistical part, Analysis, interpretation

All authors have read and approved the manuscript for submission

Conflict of interest:

None declared

Availability of data and material:

Research data and analysis is available from corresponding author on valid request

Ethical approval and consent to participate:

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Written informed consent was taken from all the participants, which is available on request.

Consent for publication:

The authors declare consent for publication. There are no individual data

Competing interest:

Authors declare no competing interest

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Statement about Experiment where human are involved:

This prospective cohort study and methods used, was carried out in accordance with relevant guidelines and regulations

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None

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