Cohort Study

Effect of preoperative anxiety on postoperative pain on patients undergoing elective surgery: Prospective cohort study

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ABSTRACT

Introduction: Anxiety is a feeling of tension, apprehension, nervousness, fear, discomfort, and high autonomic activity with varying degrees of intensity resulting from anticipation of danger. Post-operative pain is associated with the emotional status, behavioural response, and high anxiety index of patients.

This study aimed to assess the effect of preoperative anxiety on Postoperative Pain in Patients Undergoing Elective Surgery.

Methods: An institutional-based prospective cohort study was conducted on patients scheduled for elective surgeries from November 1, 2019, to October 30, 2020, in Dilla University Referral Hospital. Data was collected by pretested questionnaires and analysed by SPSS version 20. Categorical data were analysed by chi-square while Continuous data were analysed by student t-test and Mann Whitney U for parametric and nonparametric data respectively with a P-value of <0.05 was considered as statistically significant.

Result: As our finding revealed patients with high preoperative anxiety experienced significantly increased postoperative pain at 2 h, 4 h, 6 h, and 12 h with the P-value of 0.012, 0.01, 0.001, and 0.002 respectively and total tramadol consumption in a patient with high preoperative anxiety level is 156.5 ± 23.4 while in low anxiety 147.1 ± 39. with a p-value of 0.036.

Conclusion: High preoperative anxiety increased the immediate postoperative pain score and 24 h tramadol consumption. It would be better to decrease preoperative anxiety levels to reduce postoperative pain and 24 h analgesic consumption.

1. Introduction

According to American Psychological Association (APA) Anxiety is defined as feelings of tension, apprehension, nervousness, fear, discomfort, and high autonomic activity with varying degrees of intensity resulting from anticipation of danger or a threatening event or something unknown [1], which may affect patients' physiological responses, hemodynamic and cognitive or its decision to undergo the intended surgical operation or avoid such procedures [2]. Clinical manifestation of anxiety is irritability, isolation, nervousness, insecurity, uncontrollable feelings of worry, concentration difficulties, sleep difficulties, headache, sweating, tingling, tachypnea, tachycardia, and hypertension. Cognitive impairment such as impaired thinking, decision making, perception, and concentration is also the consequences of anxiety [3]. The overall prevalence of preoperative anxiety as reported in some studies is in the range of 12.6–76.7% in the western population [4,5] while it is in the ranges of 39.8–70.3% in Ethiopia [6–8].

The main cause of this emotional trigger was explained by activation of the autonomic nervous system that results in different neuroendocrine (e.g. catecholamine release) changes in the body. This process ultimately causes increased heart rate, blood pressure, and myocardial workload. These exaggerated hemodynamic responses are more pronounced and associated with electrocardiographic changes in patients with pre-existing chronic hypertension [9].
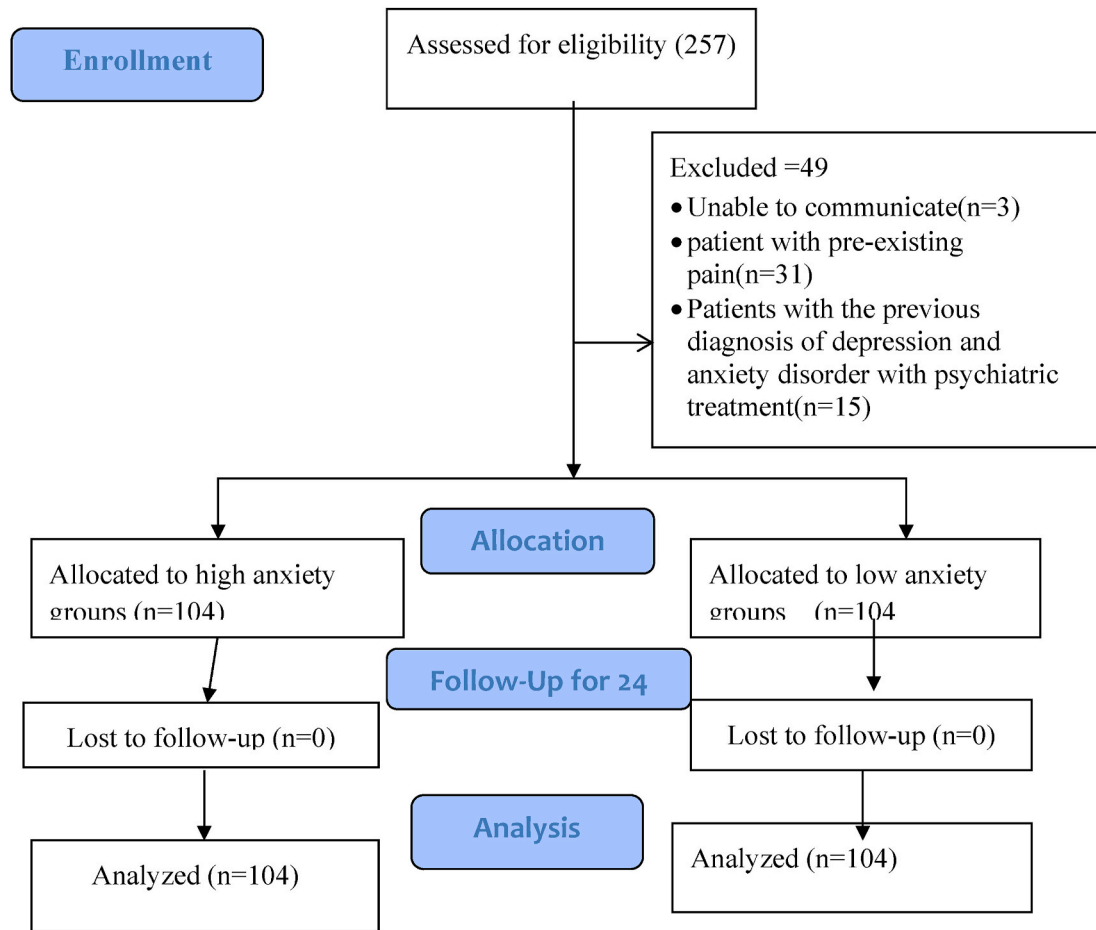
Fig. 1. Patient enrolment flow diagram.

Pain is a complex subjective experience with sensory discriminative, emotional-affective, and cognitive evaluative components. The severity of Post-operative pain is often associated with intensive stimulation of the nociceptive produced from traumatized tissue, inadequate analgesia, and the emotional status of the patient associated with the behavioural response and high anxiety index [10].

Some studies showed that psychological factors like anxiety and fear can influence the individual response to surgical intervention and postoperative pain management [11,12]. Patient with high postoperative pain has high morbidity and mortality, poor recover, impaired wound healing, poor satisfaction, and longer hospital stays. Knowing the association between preoperative anxiety and postoperative pain can help to decrease their synergic effect [13].

The study was aimed to assess the effect of preoperative anxiety on postoperative pain in patients scheduled for elective surgery.

2. Method and material

An institutional-based prospective cohort study was employed from November 1, 2019 to October 30, 2020, in XXX Hospital. Ethical clearance was obtained from the IRB of Dilla University College of Health Science and Medicine before the start of the study. Written informed consent was obtained from each study participant. The report is written inline with STROCSS guideline [14]. The study was also registered in research registry with unique identification number of researchregistry7015 www.researchregistry.com. All patients scheduled for elective surgery with the age of above 18 years were included in the study. Patients who are unable to give informed consent, Unable to communicate, patients with drug addiction, previously diagnosed

Cognitive impairment, Patients with the previous diagnosis of depression and anxiety disorder with psychiatric treatment were excluded from the study. Data were collected from selected study participants using a pretested questionnaire to maintain the quality and consistency of data. A validated and standardized preoperative anxiety measuring tool which was adapted from other studies (State-Trait Anxiety Inventory Scale (S-STAI) Version (Y-1)) [15] was used. The data was collected through interviews using a structured questionnaire during preoperative assessment and on arrival to the operation room for the assessment of preoperative anxiety. Patient with STAI >44 was categorized under high anxiety group and those with STAI <44 was followed as low anxiety group with 1:1 allocation ratio.

Pain severity was assessed using a numerical rating scale (NRS) at 2, 4, 6, 12, and 24 h postoperatively. Analgesia consumption was recorded with type and amount of drug taken up within 24 h postoperative according to the hospital guideline for both groups. Data were collected by trained two BSc anesthetists and supervised by one MSc anesthetist after giving two days of training. We investigators have no role in the perioperative management of the patients. For this study, the following definitions were used:

Postoperative pain: the presence of pain in the postoperative period is defined as a patient complaining of pain after the immediate arrival of PACU and any pain score other than zero within 24 h of surgery.

Level of anxiety: - expressed by a score of S- STAI as high-level anxiety and low-level anxiety.

High-level anxiety: - Patient who scores S- STAI >44.

Low-level anxiety: - Patient who scores S- STAI ≤44.

Pre-existing pain: - patient with NSR pain score greater than 3 on preoperative assessments.

Table 1
Socio-Demographic Characteristics of Patients Undergoing Elective surgery at Dilla University Referral Hospital.

Variables		Anxiety		Total	P-value
		Low	High		
Age in years		36.32 ± 14.71	39.85 ± 16.66		0.11
Sex	Male	29 (13.9%)	25(12%)	54 (25.9%)	0.53
	Female	75 (36.1%)	79 (38.0%)	154 (74.1%)	
Religion	Protestant	52(25%)	54(26%)	106 (51%)	0.19
	Orthodox	34 (16.3%)	39 (18.8%)	73 (35.1%)	
	Muslim	14(6.7%)	11(5.3%)	25(12%)	
	Others	4(1.9%)	0	4(1.9%)	
Residency	Rural	43 (20.1%)	48 (23.1%)	91 (43.8%)	0.48
	Urban	61 (29.3%)	58 (26.9%)	117 (56.2%)	
Educational status	Illiterate	28 (13.5%)	32 (15.3%)	60 (28.8%)	0.08
	Primary	25(12%)	33 (15.9%)	58 (27.9%)	
	Secondary	34 (16.3%)	18(8.7%)	52(25%)	
	College and above	17(8.2%)	21 (10.1%)	38 (18.3%)	
Previous surgery	Yes	41 (19.7%)	33 (15.9%)	74 (35.6%)	0.25
	No	63 (30.3%)	71 (34.1%)	134 (64.4%)	
ASA status	ASA 1	43 (20.7%)	39 (18.8%)	82 (39.4%)	0.33
	ASA 2	61 (29.3%)	63 (30.3%)	124 (59.6%)	
	ASA 3	0	2(1%)	2(1%)	

Hint: -Value is presented as Mean ± standard deviation: student T-test, Number (%): chi-square test and $p < 0.05$ is statistically significant.

2.1. Sample size and sampling technique

The sample size was calculated after a pilot study done on 30 patients scheduled for surgery. The 4th-hour NRS score was used for our sample size calculation since it gives the maximum sample size needed. The mean NRS score at the 4th hour was 4.8 with an SD of 1.475 for those with high anxiety and 4.2 with an SD of 1.475 for those low anxiety groups. By considering the power of 80% and confidence interval of 95% we got 95 participants in each group. By adding a 10% non-response rate total of 208 participants was selected using a systematic random sampling technique.

2.2. Data processing and analysis

Data were checked manually for completeness and then coded and entered into EPI info version 7 then transferred to SPSS version 20 computer program for analysis. The data were tested for normality using histogram and Shapiro–Wilk normality test and homogeneity of variance by Levene's test. Analysis was done by independent sample *t*-test for normally distributed continuous variables. Categorical data were analysed using the $\chi 2$ test. Ordinal and non-normally distributed variables were analysed by using the Mann–Whitney U test. P-value <0.05 was considered statistically significant.

3. Result

3.1. Socio-demographic characteristics of the participants

A total of 208 study participant was included for final analysis based

Table 2
Comparisons of procedure done between groups Of Patients Undergoing Elective surgery at Dilla University Referral Hospital.

Variables		Anxiety		Total	P-value
		low	High		
		No (%)	No (%)		
Procedure	C/S	35(16.8)	34(16.3)	67(33.2)	0.93
	Hysterectomy	15(7.2)	18(8.7)	33(15.9)	
	TVP	13(6.3)	12(5.8)	24(12.1)	
	Thyroidectomy	7(3.4)	7(3.4)	14(6.8)	
	Herniorrhaphy	5(2.4)	6(2.9)	11(4.3)	
	Cholecystectomy	4(1.9)	3(1.4)	7(3.4)	
	Laparotomy	2(1)	4(1.9)	6(2.9)	
	Myomectomy	10(4.8)	8(3.8)	18(8.6)	
	Mastectomy	2(1)	1(0.5)	3(1.5)	
	Excision	4(1.9)	5(2.4)	11(4.3)	
	Drainage	3(1.4)	1(0.5)	4(1.9)	
	Reduction	1(0.5)	4(1.9)	5(2.4)	
	Vagotomy	3(1.4)	1(0.5)	4(1.9)	
Total		104	104	208	

C/S: cesarean section, TVP: transvesical prostatectomy, No (%): number (percent).

Table 3
Comparisons of intraoperative data between groups Of Patients Undergoing Elective surgery at Dilla Universtiy Referral Hospital.

		ANXIETY		P-value
		HIGH	LOW	
Type of anesthesia	GA	37	42	0.48
	SA	67	62	
Intra-operative opioids intake (mg)		62.82 ± 22.12	61.9 ± 21.55	0.85
Duration of surgery (minutes)		65.34 ± 40.43	64.62 ± 39.26	0.89

GA = general anesthesia, SA= Spinal anesthesia, ±: mean plus or minus standard deviation.

on their level of anxiety (Fig. 1). There was no statistically significant difference between the group concerning age, sex, religion, residency, educational status ASA status, and previous surgery history as shown in [Table 1].

3.2. Intraoperative data

3.2.1. Comparisons of procedure done between groups
There was no statistically significant difference between the groups concerning the procedure done with the p-value >0.05 as shown in [Table 2].

3.3. Intraoperative data

There was no statistically significant difference between the groups concerning types of anesthesia, duration of surgery, and intraoperative analgesia consumption with the p-value >0.05 as shown in [Table 3].

3.3.1. Comparison of NRS score at the different time intervals between groups
Mann-Whitney U test revealed that there was a statistically significant difference in NRS score at 2 h, 4 h, 6 h, and 12 h with the P- the value of 0.012, 0.01, 0.001, and 0.002 respectively. But there was no statistically significant difference in NRS score at 24 h with a p-value of 0.56 (Fig. 2).

3.3.2. Comparison of 24 h total analgesic consumption between groups
As a result of the independent sample, the T-test showed there was a statistically significant difference in mean Tramadol consumption within 24 h between groups with the P-value of 0.036. [Table 4].
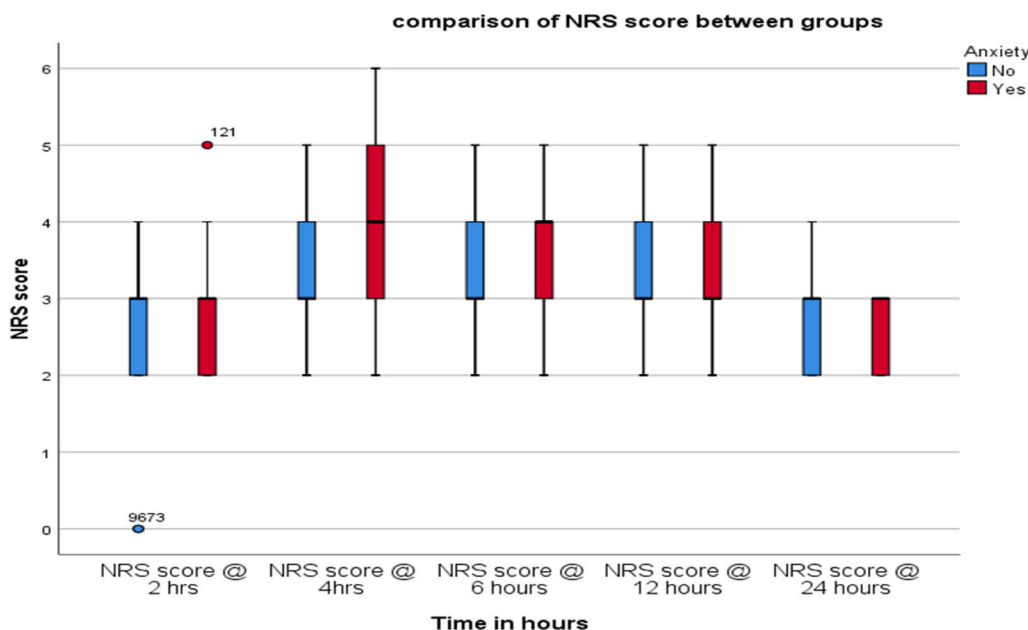
Fig. 2. Comparison of NRS scores between groups Of Patients Undergoing Elective surgery at Dilla University Referral Hospital 2020.

Table 4

24 h Total analgesia consumption Of Patients Undergoing Elective surgery at Dilla University Referral Hospital 2020.

Variables	Anxiety	Mean	Standard deviation	P-value	Effect size
Total tramadol consumption in mg	High	156.49	23.368	0.036	0.144
	Low	147.12	38.996		

4. Discussion

Hospitalized patients who undergo operation experience the physical trauma of surgery, as well as the fear and anxiety of possible outcomes [16]. Anxiety is a normal, emotional, reasonable, and expected response to real or potential danger(1) which may affect patients' physiological responses, hemodynamic and cognitive or its decision to undergo the intended surgical operation or avoid such procedures(2). A higher preoperative anxiety level in Ethiopia is expected around 61% [17].

Results of our study indicated that patient with high anxiety has high postoperative pain at 2 h, 4 h, 6 h and 12 h with the P- the value of 0.012, 0.01, 0.001 and 0.002 respectively when compared with low anxiety groups which were statistically significant. In line with our finding study done by Anchet et al. revealed that pain severity was significantly higher at 2, 4, 8, and 12 h in groups with higher preoperative anxiety [18].

Similarly, a study conducted by Bandeira R et al. is comparable to our finding with showed that postoperative pain is significantly increased at 6 h, 18 h, and 24 h in patients who had a higher level of anxiety. In contrary to our results a peak of postoperative pain was at the time 18 h postoperatively in the high anxiety group but in our study, the peak postoperative pain score is at the 4 h postoperatively the possible explanation for this difference might be the type of anesthesia they used for all patients is spinal anesthesia and the research was done on geriatrics patients. But in our study general anesthesia and spinal anesthesia were used plus we included different age group in our study [19].

Regarding 24 h total analgesia consumption patients with high preoperative anxiety had significantly increased total 24 h tramadol consumption compared to the low preoperative anxiety group which was 156.49 ± 23.368 and 147.12 ± 38.996 respectively with the P-value <0.05. Our study is in line with the study done by Achmet Ali et al. they

found that the mean tramadol consumption was 264.5 ± 29.9 220.8 ± 29.7 in the higher anxiety and lower anxiety group respectively [18]. Study done by Bandeira R et al. also showed that mean 24 h morphine consumption was higher in a patient with high preoperative anxiety [19].

5. Conclusion

High preoperative anxiety level increased postoperative pain scores at 2, 4, 8 and 12 h total tramadol consumption within 24 h was significantly increased in patients with high preoperative anxiety. It would be better to decrease preoperative anxiety levels to reduce postoperative pain and 24 h analgesic consumption.

Recommendation Other study has to be done with Randomized controlled and with large sample size.

Limitation Since this study was cohort study it was difficult to control environment factors which affect patients emotion and enough literatures are not found to discuss.

The strength It was the first study in our area that showed the relation of level of preoperative anxiety with postoperative pain.

Ethics approval and consent to participate

Ethical clearance and approval were obtained from the ethical review board of the College of Health Science and Medicine. Written informed consent for participation in the study was obtained from all patients.

Consent for publication

Not applicable.

Author's contribution

All authors have made substantial contributions to conception, design, analysis, and interpretation of data, acquisition of data, preparing the manuscript of this study, the critical review, and editing of the manuscript drafts for scientific merit and depth. All authors have read and approved the final version of the manuscript.

Provenance and peer review

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Ethical approval

Ethical approval was secured from Dilla University Institutional review board.

Consent

Informed consent was obtained from all study participants before data were collected. Participant's privacy was kept confidential.

Guarantor

Timsel Girma.

Declaration of competing interest

The authors declare that they have no competing interests.

Availability of data and materials

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amsu.2021.103190.

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