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DETERMINANTS AND PREVALENCE OF 'CHRONIC POST-THORACOTOMY PAIN SYNDROME' IN PATIENTS UNDERGOING OPEN THORACOTOMY-AN OBSERVATIONAL STUDY

Anaesthesiology

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ABSTRACT

Introduction Chronic post-thoracotomy pain is defined as pain persisting after thoracotomy at least 2 months post-surgery. The worldwide prevalence in works of literature ranges from 33-91% [1]. In India, the prevalence is around 40%. But there are no regional studies evaluating its prevalence in our population. **Objectives** Primary 1. To study the prevalence of chronic post-thoracotomy pain syndrome (CPTP) in the study population, Secondary 1. To study the determinants of chronic post-thoracotomy pain syndrome. Methods This was an observational study done in a Government medical college, in Thrissur, Kerala, India. The patients were recruited from those who were planning to do elective and emergency thoracotomy. Details on surgery, sociodemographic, and clinical profiles were collected. Patients were then followed up for 6 months to assess the prevalence and determinants of CPTP. **Results & Discussion** A total of 60 subjects (males-35 and females-25) underwent thoracotomy over one year at Government Medical College, Thrissur, and all of them were enrolled in our study. The mean age of the study population was 50.65+/- 11.54 years, Weight 55.83+/-13.30kg, and Height 158.83+/- 8.16cm. **Conclusion** Better pain management during the perioperative period would help in reducing the prevalence of PTPS. We observed our determinants like preoperative chronic pain, presence of early post-operative pain, presence of persistent drain tube, increase postoperative analgesic requirement, and preoperative anxiety all can contribute to post-operative chronic pain.

KEYWORDS

Chronic Post-thoracotomy Pain, Prevalence, Determinants

INTRODUCTION

According to IASP pain is defined as an unpleasant sensory and emotional experience associated with or resembling actual or potential tissue damage(1). Chronic postsurgical pain indicates that the pain persists after the expected recovery period in the area associated with surgery(2). Chronic post-surgery pain has an impact on the functioning and quality of life of the affected patients. It is also defined as pain persisting at least three months after surgery, that was not present before surgery or that had different characteristics or increased intensity from preoperative pain, which is localized to the surgical site or a referred area, and other possible causes of pain were excluded (4) (5) (6) . The incidences of chronic postoperative pain have been reported after limb amputation to about 60-80%, 30% after total hip arthroplasty, 5-30% after hysterectomy, 10% after cesarean section, 20-50% for breast surgery, 10% after groin hernia surgery, 20% after sternotomy and 25-60% after thoracic surgery (7).

Nerve damage after surgery is the main reason for the development of chronic postsurgical pain(8). Open thoracotomy is done for various lung pathology. Intercostal nerve injury is the main reason for chronic postoperative pain and we have various surgical technique to prevent this(9).

The International Association for the Study of Pain (IASP) defines Chronic post-thoracotomy pain syndrome(CPTP) or post-thoracotomy pain syndrome (PTPS) or post-thoracotomy neuralgia as pain that recurs or persists along the thoracotomy incision for at least 2 months following the surgical procedure (3). Pain following thoracotomy is characterized by an aching sensation in the distribution of the incision. It usually resolves in the two months following the surgery. Pain that persists beyond this time or recurs may have a burning dysesthetic component. There may also be a pleuritic component to the pain. Movements of the ipsilateral shoulder make the pain worse (10).

Acute post-thoracotomy pain can lead to severe respiratory complications such as hypoventilation, hypoxemia, atelectasis, pulmonary infections, and ultimately respiratory failure (3). Inadequate postoperative pain control may also lead to postoperative thoracotomy pain syndrome that can persist for months to years. The effects of chronic post-thoracotomy pain are generally less detrimental but can be incapacitating, making daily activities impossible. Even a gentle stimulation over the surgical site may lead to intense pain, thus preventing daily routine activities.

Newer and safer regional analgesic techniques combined with general anesthesia for perioperative pain management provide patients with pain control, allowing them to facilitate coughing, early ambulation, and deep breathing exercises needed for optimal postoperative pulmonary hygiene and function (11). Many pharmacological strategies can be used preoperatively for acute pain management and thus reduce chronic post-thoracotomy pain (12).

According to Sven Arends, the worldwide prevalence of Post Thoracotomy Pain ranges from 33-91% (13). In India, the prevalence reported is around 40% according to the study conducted by Prachi Kar. So the prevalence of PTPS in India is less when compared to the world (14). But there are no regional studies evaluating its prevalence in our population. The effect of various psychosocial factors like anxiety, depression, and malignant disease on chronic post-thoracotomy pain (CPTP) which may have had a significant impact on the development of chronic pain. Our study is an attempt to find the prevalence of CPTP and the determinants in our population.

OBJECTIVES

Primary objective

1. To study the prevalence of Chronic Post Thoracotomy Pain Syndrome in the study population

Secondary objectives

1. To study the determinants of Chronic Post Thoracotomy Pain Syndrome
2. To assess anxiety and depression has any relation in developing chronic post thoracotomy pain

METHODOLOGY

Study setting:

This study was conducted in Government medical college, Thrissur, Kerala under the department of Anaesthesiology

Study design and participants:

This was an observational study conducted among patients who underwent open thoracotomy

Inclusion criteria:

1. Patients of both gender undergoing elective and emergency open thoracotomy during the study period.

2. Patients who give informed consent for inclusion and follow-up.

Exclusion criteria:
1. Patients with cognitive impairment.
2. Lost to follow-up.
3. Patients who receive post-op ventilation for more than one day

Sample size calculation:
The prevalence of Post-thoracotomy pain syndrome in the literature ranges from 33-91% [1]

The sample size was calculated by using the formula given below

$$n = \frac{z_\alpha^2 \times P(1-p)}{d^2}$$

Z= critical value of normal distribution at the required level of confidence = 1.96 for 95 percent confidence p = proportion of patients with PTPS = 0.62 (The average of 0.33 and 0.91 from reference)

d= 20% of P = 0.05. So the minimum sample size calculated is 58.8≅ 59

According to 2019 records, 50 people underwent open thoracotomy So all cases undergoing open thoracotomy surgery will be included in this study

Study procedure:
After obtaining ethical committee clearance, the patients were recruited by the primary investigator (PI). After getting informed written consent from patients PI interviewed the patient on a preoperative day. All the relevant data as per annexure 1 was collected. The patient was taught the objective assessment of pain and was familiarised with the study tool Numerical pain rating scale (NPRS) and patient anxiety and depression were assessed during this visit. After 24 hours of surgery, the patient was assessed for the presence of pain and quantified using NPRS. Duration of surgery, the surgical procedure undertook the technique of anesthesia, and preoperative opioid/analgesic use noted as per Performa in annexure 1.

The PI interviewed the patient on day 1(24 hours after surgery) and subsequently on day 7, 1 month, 3 months & 6 months post-thoracotomy. 7 th -day interview during a routine check-up. 1 month, 3month and 6 months by telephonic interview. The presence of pain and its nature was noted. Severity and pain at rest and motion were quantified using NPRS. The effect of pain on Activities of Daily Living (ADL) was noted.

Data collection method:
Structured questionnaire was used for data collection at each time points. The questionnaire is attached in the annexure. Data collected were entered in MS-Excel office sheet and analysed for relative proportions and statistical significance using SPSS software 21

Study period: One year

Recruitment: six months since clearance from institutional review board was obtained. From March 2021to December 2022

Follow-up: Six months after recruitment of first participant till six months after recruitment of last participant. (March 2021 to December 2022)

Data entry and analysis:
Data will be coded entered and analysed using SPSS software. Continuous variables like age, weight, height and BMI were summarized as mean with SD. Categorical variables like occupation, socioeconomic status, educational status etc. were summarized as proportions.

RESULTS
A total of 60 subjects (males-35 and females-25) underwent Thoracotomy over one year at Government Medical College, Thrissur and all of them were enrolled in our study. The mean age of the study population was 50.65+/- 11.54 years, Weight 55.83+/-13.30kg and Height 158.83+/- 8.16cm.

The prevalence of Post Thoracotomy Pain Syndrome was 41.7% and 33.3% at 3months and 6months respectively.

In our study, 45% and 37% of the male population have post-operative chronic pain in the 3 rd month and 6th months respectively, compared to the female population 36% and 28% of participants have post-operative chronic pain in the 3 rd and 6 th months respectively.

In the age group between 40-60 years 43.2% and 37.8% complained of chronic pain in the 3 rd and 6th months. But in the age group between 60-80 years 46% and 15.3% of participants complained of chronic pain in the 3 rd and 6th months. Age group between 20-40 years 40 % of participants complained of chronic pain at 6 months but statistically not significant

In our study 50% and 37.5% of underweight patients complained of chronic pain at 3rd month and 6th month respectively which is not statistically significant.

56.4% and 46.15% of participants without malignant disease developed chronic pain at 3rd and 6th month which is statistically significant.

45.4% and 36.3% of participants with right-side surgery developed chronic pain at 3rd and 6th months respectively which is statistically not significant. 50% and 35.7% of participants with a history of previous surgery developed chronic pain at 3rd and 6th months respectively is not statistically significant.

43.13% and 33.33% of participants without diabetes mellitus developed post-operative chronic pain in 3 rd and 6th months respectively but statistically not significant.

42.8% and 35.7% of participants with hypertension as comorbidity had chronic pain in the 3 rd and 6th month but in patients without hypertension 41.3% and 32.6% had developed chronic pain in the 3 rd and 6th month respectively but these are not statistically significant

60% of participants whose drain persisted for more than 3 days had chronic pain in the 3 rd and 6 th months but statistically not significant.

Out of the 60 participants, 21 were given general anesthesia with regional technique, and 39 were given general anesthesia alone. Participants with GA alone developed chronic pain in the 3 rd and 6th month than with GA + regional technique, statistically not significant.

80% of participants with preoperative anxiety had developed chronic pain at the 3 rd and 6th month respectively which is statistically significant.

40% of participants with preoperative depression complained of chronic pain in 3 rd and 6th months and it is statistically significant in 6th month.

Participants with preoperative chronic pain 55% peoples complained of chronic pain at 3rd and 6 th month respectively and it is statistically significant.
Patients with moderate and severe pain during post-operative day 1 had chronic pain at the 6 th month and it is statistically significant

All participants with ribs removed category complaints of acute pain than the ribs retracted category and both group patients complaints of post-thoracotomy pain after the 3rd month and 6th month but it is not statistically significant

Table: 1. Demographic details of the study population concerning Post-thoracotomy pain syndrome (PTPS) at 3 months and 6 months.

Variable	n	PTPS at 3Months (n)	PTPS at 6Months (n)	p-value 3 month	p-value 6 month
Gender					
Male	35	16	13	0.452	0.459
Female	25	9	7		
Age					
20-40	10	3	4	0.703	0.298
40-60	37	16	14		
60-80	13	6	2		
BMI					
Underweight	16	8	6	0.567	0.567
Normal	32	15	12		
Presence of obesity	12	2	2		

Occupation					
Yes	10	4	5	0.907	0.806
No	50	21	17		
Education					
Educated	30	8	8	0.018	0.273
Illiterate	30	17	12		
SES					
APL	3	0	0	0.133	0.209
BPL	57	25	20		

DISCUSSION

Chronic post-thoracotomy pain has been extensively studied and the result obtained but debated due to the subjective nature of pain measurement, inconsistency in the definition, and a variety of etiological and associative variables that differ across studies. The current study was done among 60 patients who underwent open thoracotomy

Discussion is arranged under the following headings
1. Prevalence of post-thoracotomy pain syndrome
2. Determinants of PTPS
3. Strength and limitations Prevalence of PTPS

We observed the prevalence of post-thoracotomy pain syndrome in 41.7% in 3 rd month and 33.3% at 6 months. Whereas, Arends et al did a meta-analysis and observed that the prevalence of PTPS reported in the literature ranges from 33% to 91% (13). Maguire et al reported the prevalence of PTPS as 31.7% and Wildgaard et al reported a prevalence of 45% (15) (16).

Hetman et al studied PTPS in 97 patients who have undergone thoracotomy and follow-up for 12 months after surgery. During follow up half of the patients reported post-thoracotomy pain. However, 20% of the patients not reporting post-thoracotomy pain at 6 months did report it at 12 months. 40% - 60% of patients experienced some kind of sensory disturbance at 6 months post thoracotomy and 20-50% of patients reported some kind of sensory disturbance at the 12th month (17) .

Kar et al while observing the prevalence of PTPS in the Indian population reported 40.86% (14). Our study done in the South Indian population has a similar result as Kar et al who has a conducted study on the Indian population

Table 2 Correlation of post-thoracotomy pain syndrome (PTPS) concerning clinical variable at 3 and 6 months

Variable	N	PTPS at 3Months (n)	PTPS at 6Months (n)	p-value 3 month	p-value 6 month
Malignant disease					
No	39	22	18	0.002	0.004
Yes	21	3	2		
Side of incision					
Left	38	15	12	0.651	0.705
Right	22	10	8		
Previous surgery					
No	46	18	15	0.47	0.829
Yes	14	7	5		
Diabetes					
No	51	22	17	0.582	1.00
Yes	9	3	3		
Hypertension					
No	46	19	15	0.918	0.829
Yes	14	6	5		
IHD					
No	59	25	20	0.394	0.476
Yes	1	0	0		
Type of Anesthesia					
GA+regional technique	21	8	5	0.786	0.390
GA	39	17	15		
Drain					
No	2	2	1	0.089	0.611
Yes	58	23	19		
Duration of Drain					
</=3 days	53	20	16	0.331	0.175
>3 days	5	3	3		
Preoperative anxiety					
No	55	22	16	0.084	0.021
Yes	5	4	4		
Preoperative depression					
No	55	24	18	0.875	0.741
Yes	5	2	2		

Determinants of PTPS

In our study males reported more chronic pain than females, which is not statistically significant. But in a study conducted by Ochroch et al, he concluded that women complained of more pain than men after thoracotomy (18). Peng et al observed that the female gender is a risk factor for developing chronic pain (19). This controversy may be due to the male predominance in our study population.

We noted that age group between 40-60 years is more affected by PTPS. According to Arends et al, age is a predictive factor for developing PTPS in young patients with age > 65 years (13). Mongarden et al concluded that patients with chronic pain were about 10 years younger than those not having it(20). Peng et al also observed that the younger age group less than 60 years is a significant risk factor for developing post-thoracotomy pain syndrome(19). A study by Maloney et observed that the younger age group is a significant risk factor for the development of post-thoracotomy pain syndrome(21). Even though the findings are consistent with our study, it is not statistically significant.

In our study we found that participants with underweight developed chronic pain at 3rd and 6th months. In contrary to the study conducted by Mazijie et al obese patients had a high risk in the development of chronic pain(22). This controversy may be due to the majority of the participants being in the low SES group.

We observed that patients who were unemployed and those with low SES had more chronic pain which is not statistically significant. In contrast to the study by Antony T et al that low SES and educational background participants have a lower complaint of chronic pain(23). The reason for the difference is that most of the participants in our study belong to low SES.

We noted that patients with diabetes had less PTPS compared to the patient without diabetes which is not statistically significant. It could be due the diabetic neuropathy which hinders the pain perception among diabetic patients. This is in contrast to Wang et al and Kar et al, who studied that chronic post-thoracotomy pain has an association with preoperative diabetes mellitus(24) (14).

Peng et al reported that preoperative hypertension is a risk factor for developing PTPS(25).In our study, we could not find any association between preoperative hypertension and PTPS.

We observed that patients who underwent previous surgical interventions and pre-operative chronic pain had developed chronic pain at 3rd and 6th months compared to those without previous surgeries and preoperative chronic pain. A similar observation was obtained by Kampe et al that preoperative thoracic pain has a high incidence of developing post-thoracotomy chronic pain(15). In contrast to these studies, Hetman et al observed that those who had pre-existing chronic pain and those who did not were almost similar with no statistically significant difference(26).

We found that our patients with chronic pain in the 6 th month had moderate to severe pain scores both at rest and movement in the postoperative day 1 than those who did not. Kampe et al also obtained a similar conclusion that chronic pain patient has a history of more intense acute pain during rest and movement but irrespective of the type of analgesia(27). Gotoda et al. also observed that patients complaints of acute postoperative increased the probability of chronic pain(28).

In this study patients given general anesthesia with a regional technique developed less chronic pain than those given general anesthesia alone. This result is similar to the Tiippana et al observed

that patient given thoracic epidural block helps in alleviating acute pain and the incidence of chronic pain of at least moderate severity was 11% and 12% at 3 and 6 months, respectively(29). Komatsu et al observed that adequate post-thoracotomy pain relief was obtained with the use of a continuous paravertebral block(30).

We noted that patients with preoperative anxiety had a higher chance of developing chronic post-thoracotomy pain at 3rd and 6th months. A study by Zang et al concluded that preoperative anxiety has a higher chance of developing post-operative chronic pain in hysterectomy patients. Browne et al and Pinto et al also observed similar results in patients who underwent total knee arthroplasty and abdominal hysterectomy respectively(31) (32) (33).

Peng et al studied that patients with chest tube drains kept for more than 4 days had chronic pain during the 6th month. In our study, we also got a similar result (19).

We found that patients without preoperative depression had developed more chronic post-thoracotomy pain than patients with preoperative depression. A 55 similar finding was obtained in a study by Carlos et al that preoperative depression was not a predictive factor in developing chronic postsurgical pain(34).

In our study, it was found that patients with malignant disease had less PTPS compared to non-malignant.

We observed that patients with more opioid use in the early postoperative period had a very low pain score

CONCLUSION

Better pain management during the perioperative period would help in reducing the prevalence of PTPS. We observed our determinants like preoperative chronic pain, presence of early post-operative pain, presence of persistent drain tube, increase postoperative analgesic requirement, and preoperative anxiety all can contribute to post-operative chronic pain. Further clinical trials may be required to explore any confounding effects that might have been present.

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CONFLICT OF INTEREST:

There are no conflicts of interest

REFERENCES

1. Raja SN, Carr DB, Cohen M, Finnerup NB, Flor H, Gibson S, et al. The revised International Association for the Study of Pain definition of pain: concepts, challenges, and compromises. Pain. 2020 Sep 1;161(9):1976–82.
2. Yoon S, Hong WP, Joo H, Kim H, Park S, Bahk JH, et al. Long-term incidence of chronic postsurgical pain after thoracic surgery for lung cancer: a 10-year single-center retrospective study. Reg Anesth Pain Med. 2020 May;45(5):331–6.
3. Gerner P. Postthoracotomy pain management problems. Anesthesiol Clin. 2008 Jun;26(2):355–67, vii.
4. Thapa P, Euasobhon P. Chronic postsurgical pain: current evidence for prevention and management. Korean J Pain. 2018 Jul;31(3):155–73.
5. Macrae WA. Chronic pain after surgery. Br J Anaesth. 2001 Jul;87(1):88–98.
6. Werner MU, Kongsgaard UE. I. Defining persistent post-surgical pain: is an update required? Br J Anaesth. 2014 Jul;113(1):1–4.
7. Wildgaard K, Ravn J, Kehlet H. Chronic post-thoracotomy pain: a critical review of pathogenic mechanisms and strategies for prevention. Eur J Cardio-Thorac Surg Off J Eur Assoc Cardio-Thorac Surg. 2009 Jul;36(1):170–80.
8. Chronic post-surgical pain | BJA Education | Oxford Academic [Internet]. [cited 2023 Jan 20]. Available from: https://academic.oup.com/bjaed/article/10/1/12/266421
9. Assessment of Long-Term Postoperative Pain in Open Thoracotomy Patients: Pain Reduction by the Edge Closure Technique [Internet]. [cited 2023 Jan 20]. Available from: https://www.infona.pl/resource/bwmeta1.element.elsevier-1dbd3922-4169-397b-aa7d-4a35b79e29ae
10. Classification of chronic pain. Descriptions of chronic pain syndromes and definitions of pain terms. Prepared by the International Association for the Study of Pain, Subcommittee on Taxonomy. Pain Suppl. 1986;3:S1-226.
11. Kelsheimer B, Williams C, Kelsheimer C. New Emerging Modalities to Treat Post-Thoracotomy Pain Syndrome: A Review. Mo Med. 2019;116(1):41–4.
12. Yakşi E, Yakşi O. Current treatment options for post-thoracotomy pain syndrome: a review. Curr Thorac Surg. 2017;2(3):103.
13. Arends S, Böhmer AB, Poels M, Schieren M, Koryllos A, Wappler F, et al. Post-thoracotomy pain syndrome: seldom severe, often neuropathic, treated unspecific, and insufficient. Pain Rep. 2020 Mar 4;5(2):e810.
14. Chronic pain following thoracotomy for lung surgeries: It's risk factors, prevalence, and impact on quality of life - A retrospective study - PubMed [Internet]. [cited 2023 Jan 20]. Available from: https://pubmed.ncbi.nlm.nih.gov/31142880/
15. Consequences of persistent pain after lung cancer surgery: a nationwide questionnaire study - PubMed [Internet]. [cited 2023 Jan 21]. Available from: https://pubmed.ncbi.nlm.nih.gov/21077845/
16. A questionnaire study investigating the prevalence of the neuropathic component of chronic pain after thoracic surgery - PubMed [Internet]. [cited 2023 Jan 21]. Available from: https://pubmed.ncbi.nlm.nih.gov/16581259/
17. Hetmann F, Kongsgaard UE, Sandvik L, Schou-Bredal I. Post-thoracotomy pain syndrome and sensory disturbances following thoracotomy at 6- and 12-month follow-ups. J Pain Res. 2017 Mar 21;10:663–8.
18. Ochroch EA, Gottschalk A, Troxel AB, Farrar JT. Women suffer more short and long-term pain than men after major thoracotomy. Clin J Pain. 2006 Jun;22(5):491–8.
19. A retrospective study of chronic post-surgical pain following thoracic surgery: prevalence, risk factors, incidence of neuropathic component, and impact on qualify of life - PubMed [Internet]. [cited 2023 Jan 21]. Available from: https://pubmed.ncbi.nlm.nih.gov/24587187/
20. Assessment of chronic pain after thoracotomy: a 1-year prevalence study - PubMed [Internet]. [cited 2023 Jan 21]. Available from: https://pubmed.ncbi.nlm.nih.gov/21705876/
21. World Journal of Anesthesiology - Baishideng Publishing Group [Internet]. [cited 2023 Jan 21]. Available from: https://www.wjgnet.com/2218 -6182/CitedArticlesInF6?id=10.1016%2Fs1474-4422(14)70251-0
22. Increased Pain Sensitivity in Obese Patients After Lung Cancer Surgery - PMC [Internet]. [cited 2023 Jan 21]. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6586739/
23. Antony T, Merghani TH. The Influence of Demographic and Psychosocial Factors on the Intensity of pain Among Chronic Patients Receiving Home-based Nursing Care. Indian J Palliat Care. 2016;22(3):362–5.
24. Prevalence and risk factors of chronic post-thoracotomy pain in Chinese patients from Peking Union Medical College Hospital - PubMed [Internet]. [cited 2023 Jan 21]. Available from: https://pubmed.ncbi.nlm.nih.gov/22932175/
25. A retrospective study of chronic post-surgical pain following thoracic surgery: prevalence, risk factors, incidence of neuropathic component, and impact on qualify of life - PubMed [Internet]. [cited 2023 Jan 21]. Available from: https://pubmed.ncbi.nlm.nih.gov/24587187/
26. Does chronic pre-operative pain predict severe post-operative pain after thoracotomy? A prospective longitudinal study - PubMed [Internet]. [cited 2023 Jan 21]. Available from: https://pubmed.ncbi.nlm.nih.gov/23859248/
27. Kampe S, Geismann B, Weinreich G, Stamatis G, Ebmeyer U, Gerbershagen HJ. The Influence of Type of Anesthesia, Perioperative Pain, and Preoperative Health Status on Chronic Pain Six Months After Thoracotomy-A Prospective Cohort Study. Pain Med Malden Mass. 2017 Nov 1;18(11):2208–13.
28. The morbidity, time course and predictive factors for persistent post-thoracotomy pain - PubMed [Internet]. [cited 2023 Jan 21]. Available from: https://pubmed.ncbi.nlm.nih.gov/11394926/
29. Post-thoracotomy pain after thoracic epidural analgesia: a prospective follow-up study - PubMed [Internet]. [cited 2023 Jan 21]. Available from: https://pubmed.ncbi.nlm.nih.gov/12694143/
30. Paravertebral block as a promising analgesic modality for managing post-thoracotomy pain - PubMed [Internet]. [cited 2023 Jan 21]. Available from: https://pubmed.ncbi.nlm.nih.gov/23445804/
31. Zhang L, Hao LJ, Hou XL, Wu YL, Jing LS, Sun RN. Preoperative Anxiety and Postoperative Pain in Patients With Laparoscopic Hysterectomy. Front Psychol. 2021;12:727250.
32. Browne JA. Movement pain, resting pain and depression prior to total knee replacement predict postoperative pain. Evid Based Nurs. 2013 Oct;16(4):115–6.
33. Differential predictors of acute post-surgical pain intensity after abdominal hysterectomy and major joint arthroplasty - PubMed [Internet]. [cited 2023 Jan 21]. Available from: https://pubmed.ncbi.nlm.nih.gov/25288368/
34. Periañez CAH, Diaz MAC, Bonisson PLV, Simino GPR, Barbosa MH, Mattia ALD. RELATIONSHIP OF ANXIETY AND PREOPERATIVE DEPRESSION WITH POST-OPERATIVE PAIN. Texto Contexto - Enferm [Internet]. 2020 Feb 17 [cited 2023 Jan 21];29. Availablefrom: http://www.scielo.br/j/tce/a/HVdBpmKYfJZYdgzcySQ85wK/?lang=en