RESEARCH ARTICLE

A relationship between preoperative anxiety and postoperative pain in odontectomy patients under general anesthesia at Moewardi Regional General Hospital

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ABSTRACT

Odontectomy is a surgical procedure to extract impacted teeth and also commonly performed to address dental and oral health issues. One symptom observed prior to the procedure is anxiety that may cause patients to avoid dental care. One effect attributed to preoperative anxiety in odontectomy patients includes a decrease in pain control, encompassing postoperative pain, possibly through Hypothalamic-Pituitary-Adrenal (HPA) axis. Postoperative pain itself is a complex issue requiring effective management to ensure good healing. This study aimed to determine the relationship between preoperative anxiety and postoperative pain in odontectomy patients under general anesthesia at Moewardi General Hospital and to measure the relationship between preoperative anxiety and postoperative pain intensity in patients undergoing odontectomy under general anesthesia at Moewardi General Hospital. This was a cross-sectional study of which the data were obtained through interviews. A total of 30 samples were selected from the Dental and Oral Outpatient Clinic at Moewardi General Hospital scheduled for odontectomy under general anesthesia from December 2022 to January 2023. The Amsterdam Preoperative Anxiety and Information Scale (APAIS) questionnaire and Visual Analogue Score for Pain were used respectively to measure preoperative anxiety and postoperative pain. Statistical analysis of the relationship was conducted using the Pearson Correlation Test to assess the strength of the relationship. The average preoperative anxiety level was 17.17 and the postoperative pain intensity was 3.93 with the correlation coefficient of 0.587 (p < 0.05), indicating that the relationship fell within moderate and significant category. Preoperative anxiety exhibited a moderate and significant correlation with postoperative pain in odontectomy patients under general anesthesia.

Keywords: general anesthesia; odontectomy; postoperative pain; preoperative anxiety

INTRODUCTION

The increasing prevalence of dental and oral health problems remains a significant concern in Indonesian society. The Indonesian Health Survey by Indonesian Ministry of Health (SKI) in 2023 reported that approximately 57% population in Indonesia aged older than 3 years old had dental and oral health issues, with more percentage coming from 35 years and above.[1] One common dental problem is tooth impaction, a condition where a tooth fails to erupt properly along the dental arch during growth. The recommended management for such condition often involves odontectomy surgery. To date, many individuals still feel anxious about undergoing dental procedures, including odontectomy.[2] One reason is the fear triggered by medical equipment activation, causing discomfort in the affected dental area. However, without odontectomy, complications such as infection and abscess formation may occur, leading to tooth decay and tissue damage, including the tooth root or supporting bone.[3]

Like any surgical procedure, odontectomy itself can induce anxiety. During the preoperative preparation, patients experience situations that stimulate anxiety, leading to stress before and after the operation. Several factors contribute to preoperative anxiety, such as concerns about

anesthesia recovery, inadequate information delivery, excessive pain, permanent disabilities, infections, and the risk of death. Gender is an essential factor, with females reporting increased preoperative anxiety.[4] Additionally, older patients tend to report lower anxiety levels due to fewer remaining teeth. Education level and personality type also influence anxiety levels.[3]

In adults, the incidence of preoperative anxiety varies from 11% to 80%.[5] This condition must be well managed to reduce the risk of various consequences, such as postponed surgery due to fear of pain; increased dental visits only during acute infections or inflammations; and clinical postoperative complications like pain, dental caries, unexpected discharge, neurological complications, venous thromboembolism, acute kidney failure, increased risk of death, and prolonged hospital stays.[5]

Preoperative anxiety in dental procedures is a public health concern due to its consequences and clinical complications.[6] Physiologically, preoperative anxiety can alter vital signs by activating the sympathetic nervous system and adrenal medulla, leading to catecholamine production and activating the hypothalamic-pituitary-adrenal (HPA) axis, resulting in cortisol production. The effects include physical changes in heart rate and blood pressure, ultimately leading to decreased pain control, especially postoperative pain. One of the most significant consequences of primary anxiety during surgery is pain. Conversely, multidimensional pain can also cause anxiety.[7]

High anxiety levels have been shown to negatively impact surgical processes and postoperative recovery, leading to increased stress responses, increased use of anesthesia, and worse postoperative pain.[8] Postoperative pain itself is a complex issue requiring effective management to alleviate complaints, prevent complications, and achieve optimal healing and rehabilitation. Adequate pain management can expedite postoperative recovery, leading to faster healing and a higher level of patient satisfaction.[9] In elective procedures, several factors indirectly related to pain contribute to preoperative anxiety, such as fear of not recovering from anesthesia, pain during surgery, pain perceived due to invasive procedures before surgery, and personal disclosure effects of anesthesia agents or surgical outcomes.[10] Preoperative anxiety itself can reduce postoperative pain tolerance and also the efficiency of medication itself,[11] leading to slower postoperative healing in the ward.[12] In addition, some patients that have been discharged have to be referred again to surgery department due to postoperative pain.[13]

For now, the psychoneuroimmunological mechanism explaining the relationship between preoperative anxiety and postoperative pain in humans has not been fully elucidated. Some mechanisms, observed mainly in rodent studies, suggest that HPA axis activation due to preoperative anxiety plays a crucial role in creating hypersensitivity and postoperative pain.[14] Although glucocorticoid levels do not change during preoperative anxiety, receptor inhibition caused by preoperative anxiety leads to hypersensitivity and postoperative pain.[15] Changes in the HPA axis due to stress and preoperative anxiety increase astrocyte activation in the spinal cord, leading to postoperative pain, especially in the Anterior Cingulate Cortex (ACC).[16] Several studies have indicated that high preoperative anxiety levels are determinants of postoperative pain in various surgical procedures, such as digestive,[17] obstetric,[18] and gynecological[19] surgeries.

However, no data have been found regarding this relationship in patients undergoing odontectomy under general anesthesia. Therefore, this study aimed to investigate the relationship between preoperative anxiety and postoperative pain intensity in patients scheduled for odontectomy under general anesthesia. The study expectedly serves as a reference for managing preoperative anxiety and postoperative pain in odontectomy patients, leading to improved outcomes and reduced postoperative pain risks in the future.

MATERIALS AND METHODS

This was an observational analytical study with a cross-sectional design aimed at assessing the relationship between preoperative anxiety and postoperative pain in patients undergoing odontectomy under general anesthesia at Dr. Moewardi Regional General Hospital, Surakarta. This study utilized the APAIS instrument for assessing preoperative anxiety and the VAS-Pain scale for measuring pain scores. Both instruments have been validated in Indonesian. The APAIS was validated by Perdana et al.,[20] achieving scores of 0.825 and 0.863 for the two subscales related to preoperative anxiety with score ranges between 6 – 30. The VAS-Pain was validated by Andreyani & Bhakti (21), with a score of 0.937 for postoperative pain measurement with score ranges between 0 – 10.

The research subjects were patients scheduled for odontectomy under general anesthesia from the Dental and Oral Outpatient Clinic at Moewardi Regional General Hospital within the period of December 2022 to January 2023. The subjects were instructed to fill out both questionnaires which were given by the researchers at two different times, namely maximum 2 hours before surgery for the preoperative anxiety, and for VAS score conducted maximum 6 hours after surgery for VAS score. The subjects were selected by a purposive sampling technique, i.e., to select subjects based on predetermined inclusion and exclusion criteria, as explained in Table 1.

The normality of the obtained data was tested, with appropriate adjustments made accordingly. The Shapiro-Wilk test was used to assess the data normality because this study used <50 samples. In addition, the Pearson Correlation test was used to test the strength, direction, and significance of the relationship between variables. Confounding variables, such as age, gender, and education level were also controlled by multiple linear regression. All statistical analyses were conducted using IBM SPSS Version 25.0.

RESULTS

The research subjects were patients scheduled to undergo odontectomy surgery under general anesthesia at Dr. Moewardi Regional General Hospital Surakarta who met the inclusion criteria. The data collection was conducted by the researcher from December 2022 to January 2023. The sample for each group consisted of 30 subjects, all of whom did not receive any treatment during the surgical process. The demographic characteristics of the research subjects can be seen in Table 2 below.

Table 1. Selection criteria of this study

Inclusion criteria	Exclusion criteria
1. Adult patients aged 18-60 years as per the World Health Organization (WHO) definition.	1. Patients diagnosed with severe mental disorders.
2. Patients undergoing preoperative and postoperative odontectomy under general anesthesia who were willing to participate in the study by signing an informed consent form.	2. Patients with a history of substance and alcohol abuse.
3. Patients capable of communicating effectively in Bahasa Indonesia.	3. Patients with life-threatening medical conditions (chronic kidney disease, heart disease).
4. Patients with good hearing ability or no hearing impairment.	4. Patients currently or previously undergoing long-term psychopharmacological treatment.
5. Patients who were literate and had a minimum education level of elementary school (SD).	5. Patients with sensory impairments which prevented participation in the study.
6. Patients classified as American Society of Anesthesiologist (ASA) I and ASA II according to assessment by anesthesiologist.	

Table 2. Research subject characteristics

Characteristic	Frequency / Mean (SD)	Percentage (%)
Gender		
Male	10	33,3
Female	20	66,7
Age	30,57 (9,87)	
Education Level		
Elementary	0	0,0
Junior High	2	6,7
Senior High	14	46,7
Undergraduate	14	46,7
Marriage Status		
Not Married	13	43,3
Married	17	56,7
Employment Status		
Unemployed	10	33,3
Employed	20	66,7
History of Cigarette Smoking		
Non Smoker	19	63,3
Smoker	11	36,7
Surgical History		
Never	9	30,0
Have undergone surgery	21	70,0

Table 3. APAIS and VAS pain scores

Variable	Mean (SD)	Mean by groups			
		Gender	Education	First surgery	Employed
APAIS	17.07 (4.50)	Female: 17.65 (4.28)	Junior High: 16.00 (11.31) Senior High: 17.36 (4.78) Undergraduate: 16.71 (4.90)	Yes: 16.67 (4.66)	Yes: 18.10 (4.39)
		Male: 15.90 (4.93)		No: 17.23 (4.58)	No: 15.00 (4.19)
VAS Pain	3.93 (0.78)	Female: 4.05 (0.75)	Junior High: 4.00 (0.00) Senior High: 4.14 (0.86) Undergraduate: 3.71 (0.73)	Yes: 4.00 (0.79)	Yes: 4.00 (0.92)
		Male: 3.70 (0.82)		No: 3.90 (0.89)	No: 3.80 (0.42)

Table 4. Normality test score of research variables (shapiro-wilk)

Mean of Preoperative APAIS Score (SD)	**0.100**
Mean of postoperative VAS pain score in odontectomy patients (SD)	**0.110**

Table 5. Correlation analysis

	Pearson coefficient	p-value
Correlation Coefficient between Preoperative Anxiety Scores and Postoperative Pain Intensity Scores	0.587	0.001*

*=p<0.05

Table 6. Confounding analysis by linear regression

Variables	Confounding variables	B	p- value
Preoperative anxiety	Age	-0.210	0.006*
	Gender	-0.919	0.521
	First surgery	0.216	0.885
	Education	-0.106	0.926
Postoperative pain	Age	-0.012	0.452
	Gender	-0.337	0.284
	First surgery	0.023	0.943
	Education	-0.320	0.207

*=p< 0.05

Based on the data presented in Table 2, the demographic characteristics of the research subjects were analyzed in terms of age, gender, highest level of education attained, employment status, smoking history, and history of previous surgeries.

From the study, while specific age ranges were not provided in the table, the study encompassed a range of adult subjects within the defined inclusion criteria. In terms of gender, the research subjects consisted of 10 male participants (33.3%) and 20 female participants (66.7%). In terms of educational attainment, a significant proportion of the research cohort had completed either high school (SMA/SMK) or held a diploma/undergraduate degree (D3/S1), with 14 individuals in each category (46.7%). A substantial majority of the research subjects had active employment, constituting 20 participants (66.7%) within the study cohort. In terms of smoking habits, the majority (19 participants or 63.3%) were non-smokers, and a significant portion (21 research subjects or 70.%) had undergone prior surgical procedures. The mean preoperative anxiety scores obtained through the APAIS questionnaire are explained in Table 3 below.

The data in Table 3 depict the mean characteristics of the research variables discussed in the study. The mean score of preoperative anxiety for odontectomy, measured using the APAIS questionnaire and serving as the independent variable in this research, was 17.17 (3.99), indicating moderate anxiety levels. Meanwhile, the mean score of postoperative pain intensity for odontectomy, assessed through the VAS pain questionnaire during patient interviews, was 3.93 (0.78), thus categorized as moderate pain intensity.

Prior to the statistical analysis, the normality of the research data was first tested. Given that the sample size was less than 50, the Shapiro-Wilk test was employed for normality testing. Upon conducting the test using SPSS, the obtained results are presented in Table 4.

From the data presented in Table 4, both normality test scores were >0.05, indicating a normal data distribution. Meanwhile, for the bivariate statistical analysis to examine the relationship between preoperative anxiety levels and postoperative pain intensity in patients undergoing odontectomy, the Pearson Correlation

Analysis was conducted, considering that both variables were numerical. Subsequently, during the statistical analysis, the following figures were obtained in the Table 5

From the analysis above, the correlation coefficient was moderate. To make sure whether there was also an influence with the confounding factor, such as age, gender, first surgery, and education, multiple linear regression analysis was also conducted. From the analysis, the following results were obtained as described in Table 6.

DISCUSSION

The study was conducted between December 2022 and January 2023 at the Dental and Oral Polyclinic of Dr. Moewardi Regional General Hospital Surakarta, where the respondents were interviewed directly. This research aimed to explore the demographic data of the research subjects and examine the relationship between preoperative anxiety and postoperative pain intensity in patients undergoing odontectomy under general anesthesia.

Demographic data revealed that out of the 30 samples undergoing odontectomy under general anesthesia, 20 subjects (66.7%) were female. This finding aligns with research by Muhammad & Nezar,[22] which reported that females are more frequently affected by impaction (63.78%) compared to males (36.21%). The average age of the research samples was 30.57 years, consistent with Sahetapy et al.,[23] who found that the majority of patients undergoing odontectomy were aged between 24 and 35 years.

The study indicated that the average score of preoperative anxiety levels measured by the APAIS questionnaire was 17.17, thus categorized as moderate anxiety. This supports the findings of Onwuka et al.,[24] where 45.4% of 55 patients undergoing dental procedures experienced moderate preoperative anxiety. Various factors contribute to preoperative anxiety, including fear of the surgical procedure and anesthesia, concerns about complications, and discomfort. Low anxiety levels are considered a normal psychological response and pose no harm.[23]

Furthermore, the study reported that the average intensity of postoperative pain was 3.93, indicating a low to moderate level of pain intensity. Pain intensity was assessed 4–6 hours after the surgery, falling within the low to moderate category. This finding is consistent with Wang et al.,[25] who found postoperative pain intensity ranging from 3 to 4 in patients undergoing tooth extraction, thus categorized as moderate intensity.

The obtained data were subjected to correlation analysis using Pearson correlation coefficient, revealing a correlation coefficient of 0.587 (p = 0.001) between preoperative anxiety and postoperative pain intensity in patients undergoing odontectomy under general anesthesia. According to the established criteria,[26] this correlation coefficient fell within the moderate category, and the significance of the relationship indicated a statistically significant association, as the p-value was < 0.05. In addition, for the moderate association itself, based on Wang et al.,[25] it was due to the biggest factor causing postoperative pain originated from type of surgery and also type of tissue involved in the surgery.

This is also supported by another study by Aydogdu et al.,[13] stating that from 32 patients undergoing tonsillectomy, preoperative anxiety had a significant and positive relationship with postoperative pain intensity directly or indirectly. It also is supported by another dental study by Wang et al.,[25] that assessed patients undergoing tooth extraction due to impaction.

Additionally, multiple linear regression analysis was conducted to examine confounding factors such as age, gender, education level, and history of previous surgery. It was found that only age was significantly associated with preoperative anxiety. This finding is also supported by a study from Mohsin et al.[27] stating that age was one of the independent risk factors of preoperative anxiety, especially for younger age. Khalili et al.,[28] also clarified increasing age as protective factor, where every one year of increasing age, preoperative anxiety decreased for about 2%. Also, this finding also strengthened the conclusion that there was a significant, moderate, and positive relationship between preoperative anxiety and postoperative pain intensity in

odontectomy patients under general anesthesia at Dr. Moewardi Regional General Hospital Surakarta.

This significant relationship is supported by previous studies across various surgical procedures, including dental procedures,[25] gastrointestinal surgeries,[24] and craniotomies.[29] Possible mechanisms underlying this relationship may involve the participation of Gamma-Aminobutyric Acid (GABA) in pain regulation, where anxiety may inhibit GABA receptor activity. Therefore, in clinical practice, measuring anxiety levels and implementing available management strategies such as cognitive-behavioral therapy or alternative therapies like hypnosis and music therapy are recommended to address preoperative anxiety.

However, this study has several limitations, including a relatively small sample size due to time constraints, potential subject manipulation regarding reported pain intensity and preoperative anxiety, and a lack of analysis of other variables such as type and dosage of anesthesia drugs used during surgery or intraoperative pain intensity experienced, as well as the diagnosis leading to odontectomy in patients.

CONCLUSION

Based on the findings of the research, it can be concluded that there is a moderate and statistically significant relationship between preoperative anxiety and postoperative pain intensity in patients undergoing odontectomy under general anesthesia. Based on the research findings, efforts should be made to prevent and manage preoperative anxiety by enhancing patient education regarding the surgical procedure and considering alternative therapies such as cognitive-behavioural therapy, hypnosis, music therapy, and others. It is suggested that further research involve a larger sample size and perform broader analysis of confounding variables to strengthen conclusions and minimize bias.

AUTHORS' CONTRIBUTIONS

All authors contributed to the design. FM contributed to statistical analysis and most of the study steps. DS and L assisted in designing, data interpretation, and discussion in the study. All authors have read and approved the content of the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethics approval was received from the Health Research Ethics Committee of Dr. Moewardi General Hospital (1.372 / X / HREC / 2022).

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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