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Preoperative Anxiety and Its Associated Factors in Patients Undergoing Cardiac Catheterization: A Meta-Analysis

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Abstract
Preoperative anxiety is a common psychological response among patients undergoing invasive procedures such as cardiac catheterization and may adversely affect hemodynamic stability and procedural outcomes. Evidence regarding factors associated with preoperative anxiety remains inconsistent. This study aimed to estimate the magnitude of associations between selected factors and preoperative anxiety in patients undergoing cardiac catheterization.A meta-analysis was conducted using articles retrieved from PubMed, Google Scholar, and ScienceDirect, published between 2015 and 2025. Study selection followed the PICO framework: patients undergoing cardiac catheterization; exposure factors included female gender, high social support, history of surgery, and educational status; and the outcome was preoperative anxiety. Only full-text cross-sectional studies were included. Data were analyzed using Review Manager (RevMan) version 5.3. Fourteen studies from Palestine, Nepal, Malaysia, Vietnam, Finland, Italy, Spain, Greece, Iran, Ethiopia, Canada, and China were included. The meta-analysis showed that female gender (aOR = 0.54; 95% CI: 0.37–0.80; p = 0.002), high social support (aOR = 0.64; 95% CI: 0.49–0.84; p = 0.001), and a history of surgery (aOR = 0.60; 95% CI: 0.39–0.90; p = 0.01) were protective factors against preoperative anxiety. In contrast, being educated was associated with a higher risk of preoperative anxiety (aOR = 1.64; 95% CI: 1.25–2.15; p = 0.0004). In conclusion, female gender, strong social support, and previous surgical experience reduce preoperative anxiety, whereas higher educational level increases anxiety among patients undergoing cardiac catheterization.

Keywords: *preoperative anxiety, cardiac catheterization, gender differences, social support, surgical history, educational level, meta-analysis*
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INTRODUCTION

Anxiety experienced before invasive medical procedures is a frequent psychological concern in clinical practice, particularly among patients scheduled for cardiac catheterization. Beyond emotional discomfort, preoperative anxiety has been shown to influence physiological responses, procedural cooperation, and recovery trajectories following intervention. Understanding the factors associated with this condition is therefore crucial to support more targeted and effective preoperative care (Masriani, 2020).

Sex-related differences have frequently been examined in relation to anxiety responses prior to medical procedures. Nevertheless, evidence remains inconclusive, as some studies report higher anxiety levels among women, while others observe no significant difference or contrasting patterns. These discrepancies are likely shaped by an interplay of biological characteristics and psychosocial contexts across study populations (Hernández-Palazón et al., 2018).

Psychosocial factors, particularly perceived social support, have been recognized as influential in

patients' emotional responses before invasive procedures. Support received from family members or the surrounding environment may help patients feel more secure and better prepared to cope with procedural stress. As a result, stronger social support is often associated with lower levels of preoperative anxiety (Afrassa et al., 2022).

Patients' previous medical experiences and educational backgrounds may also shape how they perceive and respond emotionally to upcoming procedures. Individuals with prior surgical experience often approach subsequent interventions with greater familiarity, which may reduce uncertainty and anxiety. Conversely, educational attainment may exert a more complex influence, as greater knowledge can both alleviate anxiety through understanding and intensify it through heightened awareness of potential risks (Bedaso & Ayalew, 2019).

Although several studies have examined the relationship between these factors and preoperative anxiety, the findings remain varied and have yet to be synthesized systematically and their findings remain inconsistent. These inconsistencies may be attributed to differences in study populations, cultural and clinical settings, sample sizes, and the instruments used to measure anxiety. In addition, variations in the operational definitions of key variables such as social support, educational level, and surgical history, as well as inadequate control of confounding factors, limit the comparability of individual studies. Given this heterogeneity, conclusions drawn from single studies may be unreliable. Therefore, a meta-analysis is needed to systematically synthesize available evidence, increase statistical power, and estimate pooled effect sizes. This approach allows for a more precise and comprehensive understanding of the factors associated with preoperative anxiety among patients undergoing cardiac catheterization and provides stronger evidence to support clinical decision-making. Therefore, this study aims to estimate the magnitude of the association between gender, social support, surgical history, and educational level with preoperative anxiety among patients undergoing cardiac catheterization.

METHODS

Research Design

This meta-analysis study review and these articles were obtained from databases namely PubMed, Google Scholar, and Science Direct. The keywords used in searching for articles in the database ("gender" OR "sex")AND ("social support") AND ("surgical history" OR "history of surgery") AND ("education" OR "educational level" OR "educate") AND ("cardiac catheterization" OR "coronary angiography" OR "CAG" OR "percutaneous coronary intervention" OR "PCI") AND ("preoperative anxiety") AND ("adjusted odds ratio" OR "aOR").

Search Strategy

A comprehensive search was conducted to find relevant English-language articles from electronic databases and the gray literature published between 2015-2025. Literature searches were carried out to identify studies investigating the association between various factors and preoperative anxiety in patients undergoing cardiac catheterization. An initial search was performed based on the PICO (participants, comparison, intervention, and outcomes) framework and key terms.

Study Selection

Study selection was carried out independently by three reviewers (JTA, SA, and RK). First stage, reviewers independently extracted information from potentially relevant titles and abstracts. The screened studies were then included in the second stage for a full-text review. Again, independently, the 3 authors read and evaluated the full-text articles based on predefined exclusion and inclusion criteria. Finally, the 3 authors compared the results, and any differences were resolved by reaching a consensus. Through this process, articles qualifying for the meta-analysis were included.

Extraction of Data

Data extraction was performed independently by three reviewers (JTA, SA, and RK) using a predefined data extraction form. Information collected from each study included the first author, year of publication, study design, study setting and country, sample size, exposure and comparison variables, and reported outcomes.

Bias and quality assessment

The methodological quality and risk of bias of the included studies were independently assessed by three reviewers (JTA, SA, and RK). The Risk of Bias in Non-randomized Studies of Interventions (ROBINS-I) tool was applied to evaluate potential bias across key domains, including confounding, participant selection, exposure classification, deviations from intended exposures, missing data, outcome measurement, and selective reporting. Each domain was rated as having low, unclear, or high risk of bias.

Inclusion Criteria

The inclusion criteria used in this study were full-text articles with a cross-sectional study design. Articles were published in English and Indonesian from 2015-2025. The final results were reported using the adjusted Odds Ratio (aOR).

Exclusion Criteria

Exclusion criteria in this study were different operational definitions, anonymous research, articles that did not use univariate and bivariate analysis, and articles that used quasi experiment, protocol study, pilot study, cohort, case control, and RCT study designs.

Operational Definition of Variables

Sex refers to the biological identity of the patient, categorized as male or female based on demographic data reported in the primary studies.

Social support is defined as the patient's perceived level of emotional, instrumental, or informational assistance received from family, friends, or healthcare providers, and is classified as high or low according to the measurement tools or criteria used in each study.

Surgical history refers to whether or not a patient has previously undergone surgery, based on medical records documented in the respective studies (categorized as yes or no).

Education in this study is classified into two categories: educated and illiterate. Educated refers to patients who have the ability to read and write, while illiterate refers to those who do not, as recorded in the demographic data of the primary studies. This classification is used to assess the influence of basic literacy on preoperative anxiety.

Anxiety is defined as a feeling of unease experienced by patients before undergoing cardiac catheterization, measured using validated psychological instruments such as the STAI, HADS, or VAS.

Instruments

The instrument in this study was the PRISMA Flow Diagram using primary study quality assessment for a cross-sectional meta-analysis research design.

Data Analysis

The collected studies were selected based on predetermined eligibility criteria. This research utilized secondary data obtained from previously published studies. Data synthesis and statistical analyses were conducted using Review Manager (RevMan) version 5.3. The analysis included calculating the effect size and heterogeneity values to determine the appropriate model for data synthesis, which produced the final meta-analysis results in the form of a forest plot and funnel plot.

RESULTS

The article search process through online publication databases resulted in 14 selected studies originating from Asia, Europe, America, and Africa.

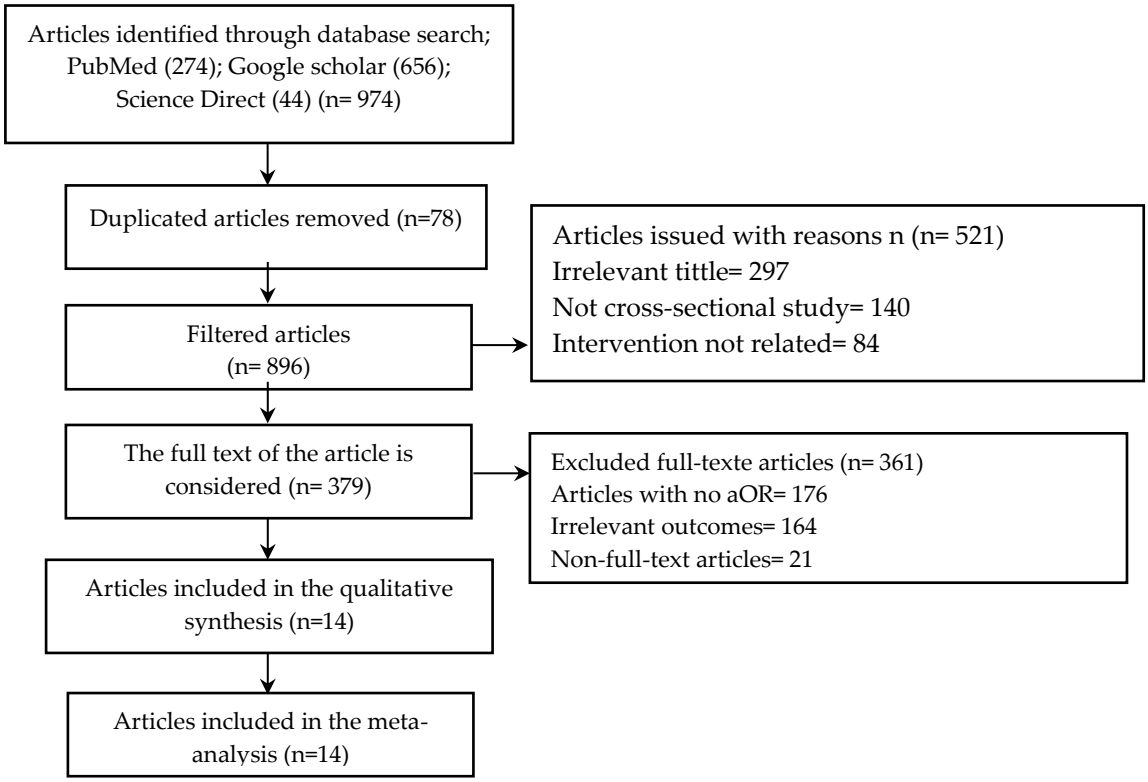

Figure 1. Results of PRISMA Flow diagrams preoperative anxiety and its associated factors in patients undergoing cardiac catheterization

Figure 1 presents the PRISMA flow diagram of preoperative anxiety and its associated factors in patients undergoing cardiac catheterization. This systematic review initially identified 974 articles from various databases and narrowed them down to 14 studies that met the inclusion criteria. After removing duplicates and screening titles/abstracts, 896 full-text articles were assessed, with 521 excluded due to not meeting eligibility criteria. This rigorous selection process ensured that only the most relevant studies were included for further analysis.

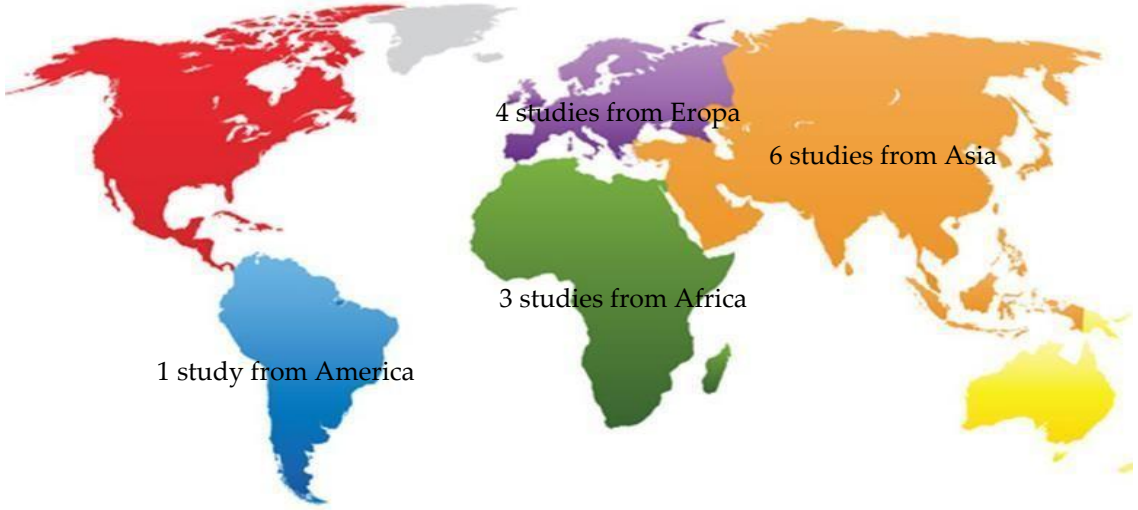

Figure 2. Research distribution map on preoperative anxiety and its associated factors in patients undergoing cardiac catheterization

Figure 2 shows a map of the research area of preoperative anxiety and its related factors in patients undergoing cardiac catheterization that will be included in the meta-analysis, consisting of 4 continents, namely Asia, Europe, America and Africa.

Table 1 presents the results of a quality assessment of primary studies examining preoperative anxiety and associated factors in patients undergoing cardiac catheterization. Each study was evaluated based on seven criteria (1–7), each with sub-criteria scored (a, b, c, d) using a 0–2 rating scale. The "Total" column shows the overall score for each study. The data show that most studies obtained high scores (25–26), indicating good methodological quality.

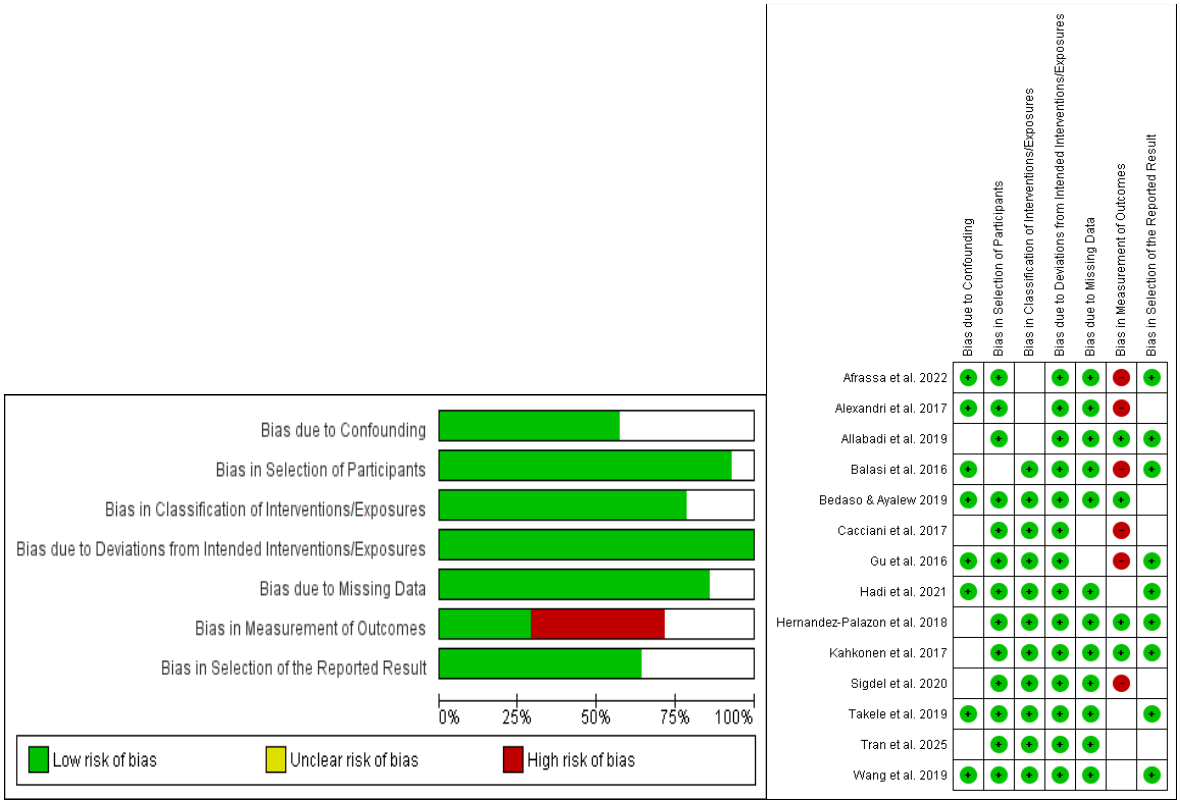

Figure 3. Risk of bias of the included studies using Rev-Man 5.3

Figure 2 shows the Risk of Bias (RoB) analysis of 14 studies, most demonstrated good methodological quality with a low risk of bias across the majority of domains, particularly confounding, participant selection, exposure classification, intervention deviations, missing data, and outcome reporting (>75% of studies). However, outcome measurement bias emerged as a key concern: approximately 40% of studies showed a high risk of bias in this domain, notably those by Alexandri et al. (2017), Balasi et al. (2016), Gu et al. (2016), and Sigdel et al. (2020), likely due to the absence of blinding or the use of instruments that were not valid or consistent.

Thus, while the majority of studies reflect strong methodological quality, special attention should be given to improving outcome measurement to minimize potential bias and enhance the validity of future research findings. This evaluation is crucial to ensuring the reliability of scientific evidence used in evidence-based practice and policy.

Table 1. The quality assessment result on preoperative anxiety and its associated factors in patients undergoing cardiac catheterization

Primary Study	Criteria													Total
	1				2		3		4	5	6		7	
	a	b	c	d	a	b	a	b			a	b		
(Gu et al., 2016)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
(Rouhi Balasi et al., 2016)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
(Alexandri et al., 2017)	2	0	1	2	2	2	2	2	2	2	2	2	2	24
(Cacciani et al., 2017)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
(Kähkönen et al., 2017)	2	0	2	2	2	2	2	2	2	2	2	2	2	25
(Rodríguez-Hernández et al., 2021)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
(Bedaso & Ayalew, 2019)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
(Takele et al., 2019)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
(Wang et al., 2019)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
(Allabadi et al., 2019)	2	0	2	2	2	2	2	2	2	2	2	2	2	25
(Sigdel et al., 2020)	2	2	2	2	2	2	2	2	2	2	2	2	2	26
(Hadi et al., 2022)	2	0	1	2	2	2	2	2	2	2	2	2	2	24
(Afrassa et al., 2022)	2	0	1	2	2	2	2	2	2	2	2	2	2	24
(Jones et al., 2017)(Tran et al., 2025)	2	2	2	2	2	2	2	2	2	2	2	2	2	26

Table 2. Description of the primary study on preoperative anxiety and its associated factors in patients undergoing cardiac catheterization

Author (Year)	Country	Sampel	Population	Intervention	Comparison	Outcome
(Gu et al., 2016)	China	210	Adult patients undergoing coronary angiography	Educate	Illeterate	preoperative anxiety
(Rouhi Balasi et al., 2016)	Iran	180	Patients undergoing elective cardiac catheterization at Shahid Rajaei Cardiovascular Hospital, Tehran	Female, educate	Male, illeterate	preoperative anxiety
(Alexandri et al., 2017)	Greece	148	Patients undergoing cardiac catheterization at three public hospitals in Athens	High social support, female	Low social support, male	preoperative anxiety
(Cacciani et al., 2017)	Italy	14,013	Patients aged 35–74 years undergoing cardiac catheterization and residing in Rome	Female	Male	preoperative anxiety
(Kähkönen et al., 2017)	Finland	416	Patients with coronary artery disease undergoing percutaneous coronary intervention (PCI)	Female	Male	preoperative anxiety
(Rodríguez-Hernández et al., 2021)	Spain	200	Adult patients (>18 years) undergoing cardiac	Female	Male	preoperative anxiety

Author (Year)	Country	Sampel	Population	Intervention	Comparison	Outcome
			catheterization, with a mean age of 64 years			
(Bedaso & Ayalew, 2019)	Etiophia	402	Adult patients (>18 years) undergoing cardiac catheterization	High social support, having surgical history, educate	Low social support, not having surgical history, illeterate	preoperative anxiety
(Takele et al., 2019)	Etiophia	237	Adult patients undergoing cardiac catheterization at St. Luke's Catholic Hospital and Nursing College, Ethiopia	Educate	Illeterate	preoperative anxiety
(Wang et al., 2019)	Canada	3,036	Adult patients (>18 years) in Alberta, Canada, who experienced acute coronary syndrome (ACS) and underwent first-time cardiac catheterization between 2004 and 2011	Having surgical history	Not having surgical history	preoperative anxiety
(Allabadi et al., 2019)	Palestina	1,053	Adult patients (aged 30–80 years) undergoing cardiac catheterization at Nablus Hospital	High social support, female, having surgical history, educate	Low social support, male, not having surgical history, illeterate	preoperative anxiety
(Sigdel et al., 2020)	Nepal	140	Adult Nepali patients scheduled to undergo cardiac catheterization	Female	Male	preoperative anxiety
(Hadi et al., 2022)	Malaysia	65	Adult patients (>18 years) undergoing coronary angiography and percutaneous coronary intervention (PCI)	Female, educate	Male, illeterate	preoperative anxiety
(Afrassa et al., 2022)	Etiophia	243	Adult patients scheduled to undergo cardiac catheterization at Saint Peter Specialized Hospital and Addis Cardiac Center, Addis Ababa, Ethiopia	High social support, having surgical history	Low social support, not having surgical history, illeterate	preoperative anxiety
(Jones et al., 2017)(Tran et al., 2025)	Vietnam	306	atients undergoing coronary angiography	Having surgical history	Not having surgical history	preoperative anxiety

Table 3. aOR and 95% CI data the effect of gender on preoperative anxiety in patients undergoing cardiac catheterization

(Author, Year)	aOR	95% CI	
		Lower Limit	Upper Limit
Balasi et al. (2016)	0.24	0.08	0.67
Cacciani et al. (2017)	0.81	0.66	0.97
Alexandri et al. (2017)	0.33	0.08	1.41
Kahkonen et al. (2017)	0.4	0.2	1.41
Hernandez-Palazon et al. (2018)	1.25	0.61	2.52
Allabadi et al. (2019)	0.68	0.43	1.10
Sigdel et al. (2020)	0.25	0.11	0.57
Hadi et al. (2021)	0.42	0.12	1.44

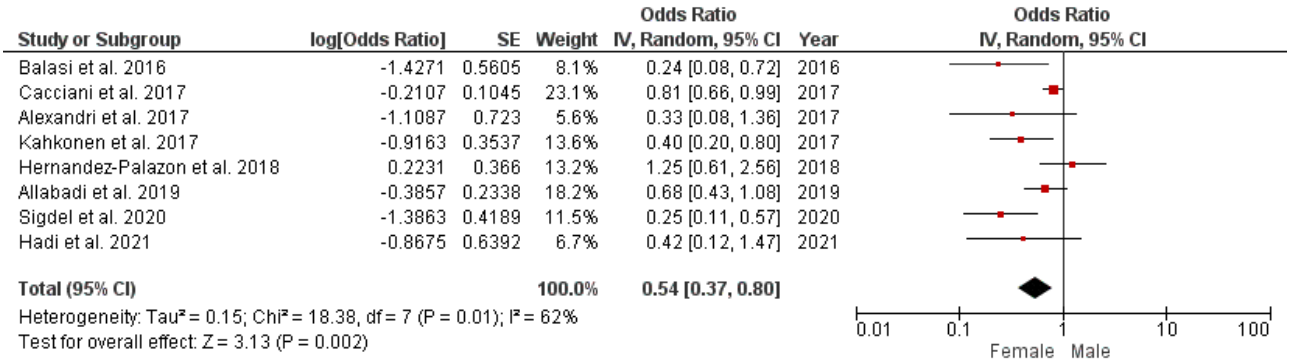

Figure 3. Forest plot of the effect of gender on preoperative anxiety in patients undergoing cardiac catheterization

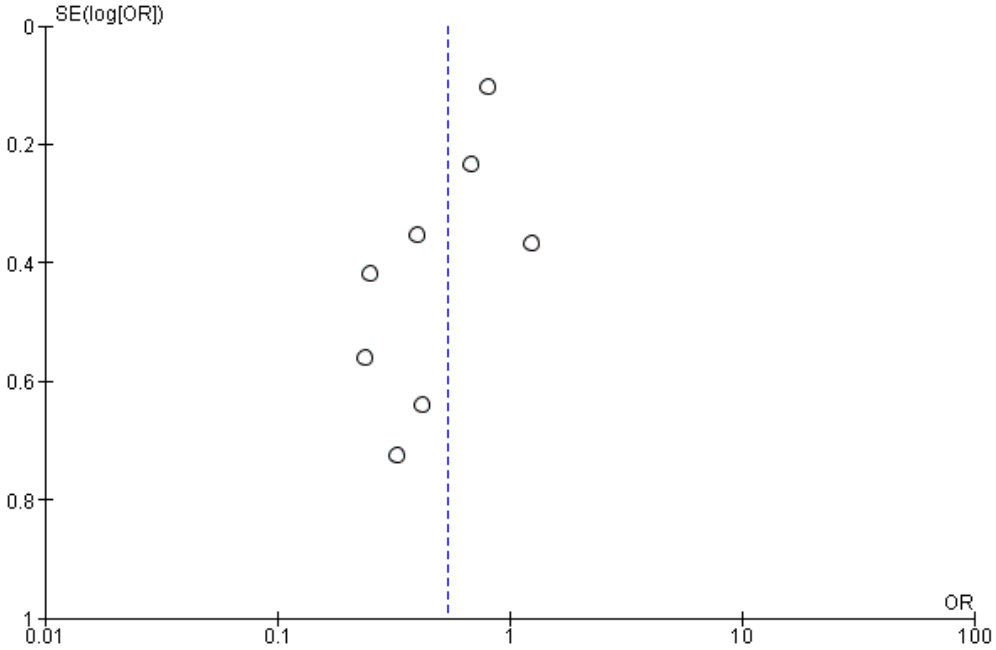

Figure 4. Funnel plot of the effect of gender on preoperative anxiety in patients undergoing cardiac catheterization

Table 3 presents the adjusted odds ratio (aOR) values from studies examining the effect of gender on preoperative anxiety in patients undergoing cardiac catheterization, with the highest aOR reported by Hernandez-Palazon et al. (2018) and the lowest by Balasi et al. (2016).

The forest plot in Figure 3 shows that female gender reduces preoperative anxiety. Female patients undergoing cardiac catheterization were 0.54 times less likely to experience preoperative anxiety compared to male patients (aOR = 0.54; 95% CI = 0.37 to 0.80; p = 0.002), and this result was statistically significant. The heterogeneity among studies was moderate (I^2 = 62%), thus the random-effects model (REM) was applied.

Figure 4 displays the funnel plot illustrating the effect of gender on preoperative anxiety in patients undergoing cardiac catheterization. The distribution of effect estimates across studies appears symmetrical on both sides of the vertical line representing the overall effect, indicating no evidence of publication bias.

Table 4. aOR and 95% CI data the effect of social support on preoperative anxiety in patients undergoing cardiac catheterization

(Author, Year)	aOR	95% CI	
		Lower Limit	Upper Limit
Alexandri et al. (2017)	0.78	0.29	2.08
Bedaso & Ayalew 2019	0.16	0.007	0.34
Allabadi et al. (2019)	0.74	0.54	1.00
Afrassa et al. (2022)	3.03	1.56	5.88

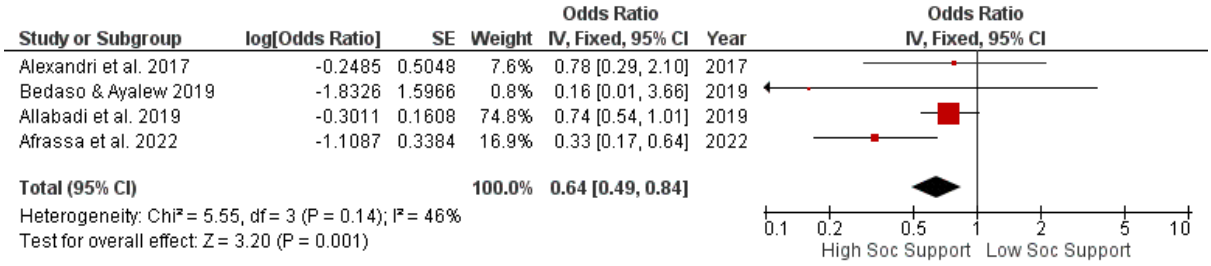

Figure 5. Forest plot of the effect of social support on preoperative anxiety in patients undergoing cardiac catheterization

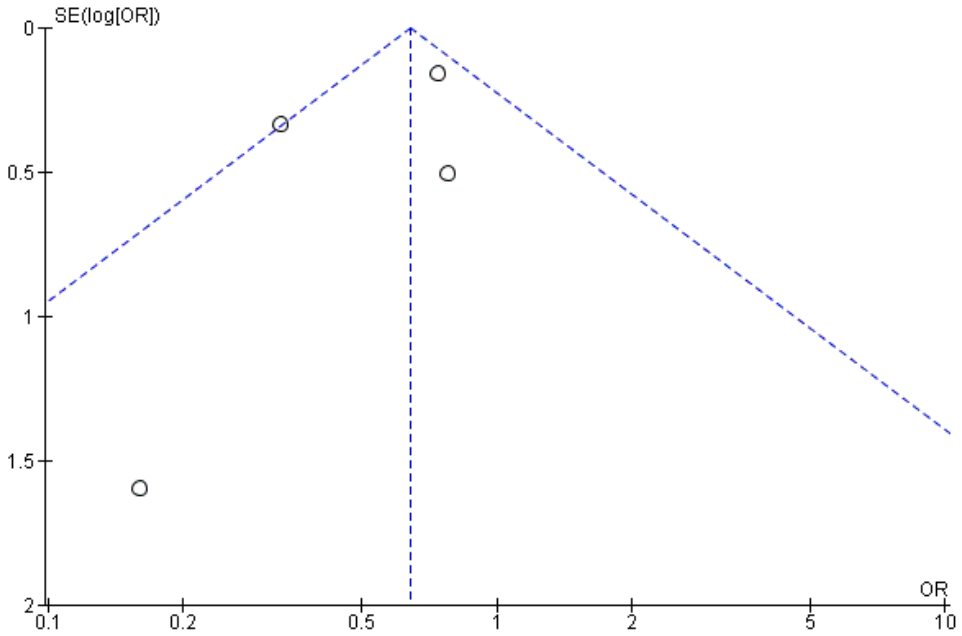

Figure 6. Funnel plot of the effect of social support on preoperative anxiety in patients undergoing cardiac catheterization

Table 4 presents the adjusted odds ratio (aOR) values from studies examining the effect of social support on preoperative anxiety in patients undergoing cardiac catheterization. The highest aOR was reported by Alexandri et al. (2017), and the lowest by Bedaso & Ayalew (2019).

The forest plot in Figure 5 shows that high social support reduces preoperative anxiety. Individuals with high levels of social support had a 0.64 times lower risk of experiencing preoperative anxiety compared to those with low social support (aOR = 0.64; 95% CI = 0.49 to 0.84; p = 0.001), and the result was statistically significant. The heterogeneity across studies was moderate (I^2 = 46%), and therefore, a fixed-effects model (FEM) was applied.

Figure 6 presents the funnel plot depicting the effect of social support on preoperative anxiety in patients undergoing cardiac catheterization. The distribution of effect estimates across studies appears asymmetrical around the vertical line of the average estimate, indicating the presence of publication bias. Since the bias is concentrated on the left side of the vertical line—aligned with the direction of the diamond in the forest plot—this suggests that the publication bias may lead to an overestimation of the true effect of social support on preoperative anxiety.

Table 5. aOR and 95% CI data of the effect of surgical history on preoperative anxiety in patients undergoing cardiac catheterization

(Author, Year)	aOR	95% CI	
		Lower Limit	Upper Limit
Allabadi et al. (2019)	0.89	0.62	1.29
Bedaso & Ayalew 2019	0.27	0.07	0.97
Wang et al. (2019)	0.81	0.47	1.41
Afrassa et al. (2022)	0.42	0.23	0.94
Tran et al. (2025)	0.37	0.19	0.69

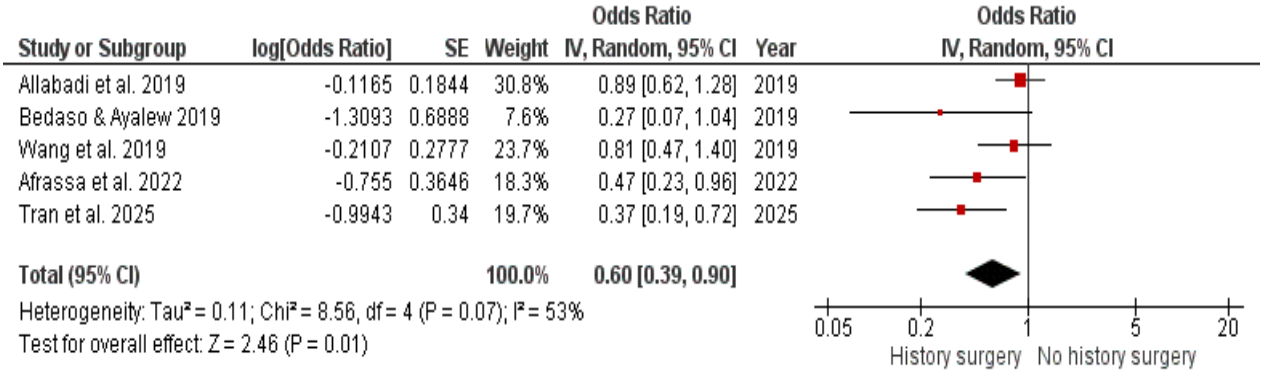

Figure 7. Forest plot of the effect of surgical history on preoperative anxiety in patients undergoing cardiac catheterization

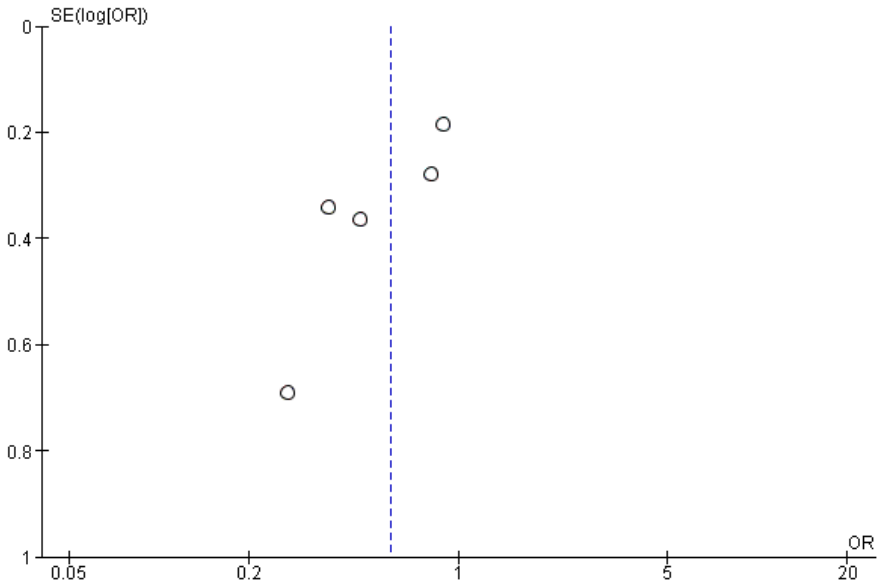

Figure 8. Funnel plot of the effect of surgical history on preoperative anxiety in patients undergoing cardiac catheterization

Table 5 presents the adjusted odds ratio (aOR) values from studies examining the effect of surgical history on preoperative anxiety in patients undergoing cardiac catheterization. The highest aORs were reported by Allabadi et al. (2019) and Bedaso & Ayalew (2019).

The forest plot in Figure 7 indicates that having a history of previous surgery reduces preoperative anxiety. Patients with a surgical history were 0.60 times less likely to experience preoperative anxiety compared to those without such history (aOR = 0.60; 95% CI = 0.39 to 0.90; p = 0.01), and the result was statistically significant. The heterogeneity among studies was moderate (I^2 = 53%), thus a random-effects model (REM) was applied.

Figure 8 displays the funnel plot illustrating the effect of surgical history on preoperative anxiety in patients undergoing cardiac catheterization. The distribution of effect estimates appears balanced on both sides of the vertical line representing the overall effect estimate, indicating no evidence of publication bias.

Table 6. aOR and 95% CI data the effect of education on preoperative anxiety in patients undergoing cardiac catheterization

(Author, Year)	aOR	95% CI	
		Lower Limit	Upper Limit
Balasi et al. (2016)	2.12	0.35	12.93
Gu et al. (2016)	1.78	1.09	2.94
Takele et al. (2019)	3.08	0.20	32.68
Allabadi et al. (2019)	1.09	0.68	1.76
Bedaso & Ayalew 2019	2.45	1.29	4.60
Sigdel et al. (2020)	1.42	0.64	3.17
Hadi et al. (2021)	4.76	1.20	18.88

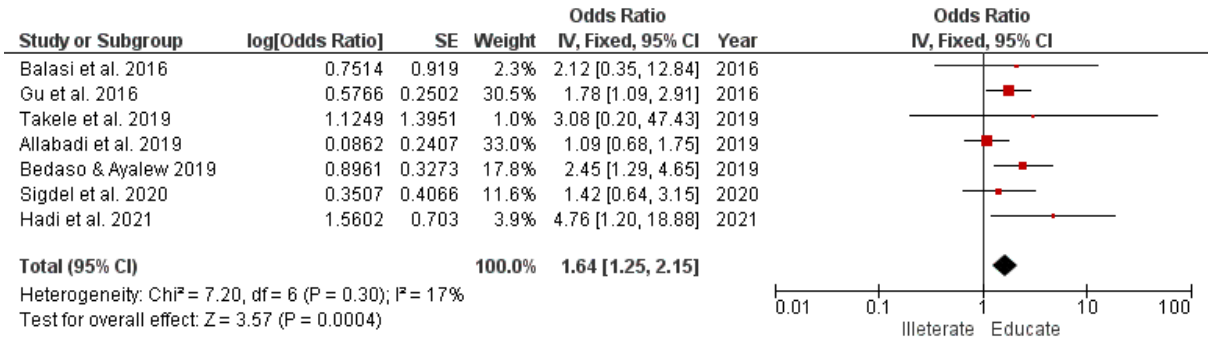

Figure 9. Forest plot the effect of education on preoperative anxiety in patients undergoing cardiac catheterization

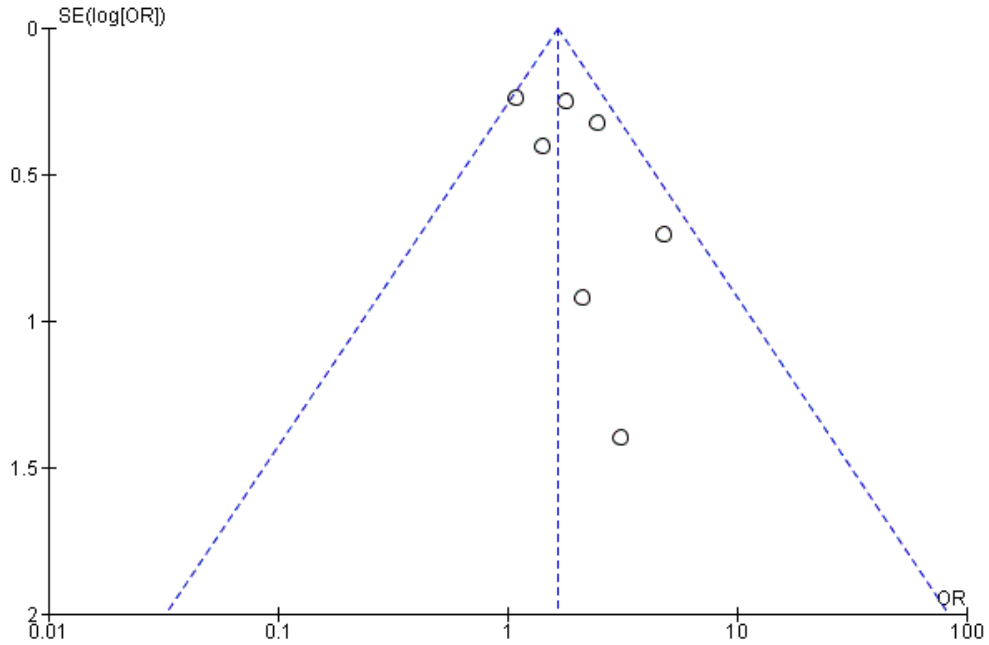

Figure 10. Funnel plot the effect of education on preoperative anxiety in patients undergoing cardiac catheterization

Table 6 presents the adjusted odds ratio (aOR) values from studies examining the effect of education on preoperative anxiety in patients undergoing cardiac catheterization. The highest aOR was reported by Hadi et al. (2021), and the lowest by Allabadi et al. (2019).

The forest plot in Figure 9 indicates that being educated increases the risk of preoperative anxiety. The results show that individuals with an educational background were 1.64 times more likely to experience preoperative anxiety compared to those who were illiterate (aOR = 1.64; 95% CI = 1.25 to 2.15; p = 0.0004), and this finding was statistically significant. The heterogeneity among studies was moderate (I^2 = 46%), and therefore, a fixed-effects model (FEM) was applied.

Figure 10 displays the funnel plot illustrating the effect of education on preoperative anxiety in patients undergoing cardiac catheterization. The distribution of effect estimates appears symmetrical on both sides of the vertical line representing the average estimate, indicating no evidence of publication bias.

DISCUSSIONS

This meta-analysis provides evidence that several patient-related factors are associated with preoperative anxiety among individuals undergoing cardiac catheterization. Female sex, stronger perceived social support, and previous surgical experience were consistently associated with lower anxiety levels, whereas higher educational attainment appeared to increase the likelihood of preoperative anxiety. These findings highlight the multifactorial nature of anxiety responses prior to invasive cardiac procedures.

Another important source of heterogeneity arises from the use of different instruments to measure anxiety, including the State-Trait Anxiety Inventory (STAI), Hospital Anxiety and Depression Scale (HADS), and Visual Analog Scale (VAS). These tools differ in sensitivity, dimensional focus, and cutoff thresholds, which may lead to inconsistent classification of anxiety levels and contribute to variability in reported associations. In addition, differences in the timing of anxiety assessment prior to catheterization may further affect outcome comparability.

Potential bias across primary studies should also be considered when interpreting the pooled results. Several studies employed cross-sectional designs with relatively small sample sizes, increasing susceptibility to selection bias and limiting causal inference. Inadequate adjustment for confounding variables—such as previous anxiety disorders, comorbid conditions, or differences in preoperative education—may have influenced the magnitude and direction of reported associations. Furthermore, variation in the operational definitions of key exposures, including social support, educational level, and surgical history, may introduce misclassification bias.

Publication bias may also contribute to between-study differences, particularly in analyses of psychosocial factors, where studies reporting significant associations are more likely to be published. Although funnel plot assessments suggested minimal publication bias in some pooled analyses, asymmetry observed in others indicates that the true effect size may be overestimated.

Overall, the presence of heterogeneity and potential bias underscores the importance of interpreting pooled estimates with caution. Nevertheless, by synthesizing data from diverse populations and settings, this meta-analysis provides a more robust and comprehensive estimate of the associations between gender, social support, surgical history, educational level, and preoperative anxiety than individual studies alone.

Clinical Relevance of Effect Size Estimates

Although the pooled effect sizes identified in this meta-analysis were generally small to moderate, they remain clinically relevant within the context of preoperative anxiety, a condition influenced by multiple biological and psychosocial factors. In such multifactorial outcomes, modest effect sizes are expected and should be interpreted as indicators of relative risk rather than isolated predictors.

From a clinical standpoint, the observed protective effects of female gender, high social support, and prior surgical history support their use in preoperative risk assessment. These factors may assist clinicians in identifying patients who are more vulnerable to anxiety and who may benefit from additional psychological support or tailored preoperative counseling. Conversely, the increased odds of preoperative anxiety among patients with higher educational levels suggest that standard information delivery may be insufficient for this group and that individualized communication strategies are warranted.

Furthermore, variability in effect sizes across studies, as reflected by moderate heterogeneity, indicates that the clinical impact of these factors may differ according to patient characteristics and healthcare settings. Therefore, the pooled estimates should be interpreted as guiding evidence to inform clinical decision-making and intervention planning, rather than as fixed thresholds. Integrating these findings into routine preoperative evaluation may contribute to more targeted anxiety management and improved patient preparedness for cardiac catheterization.

Gender and Preoperative Anxiety in Cardiac Catheterization Patients

Several studies have shown that gender may influence the level of preoperative anxiety. Generally, women are assumed to have higher anxiety levels when facing medical procedures. However, in the context of cardiac catheterization, some findings suggest that female patients tend to report lower anxiety levels compared to male patients. These differences may be attributed to psychosocial factors, life experiences, and varying coping mechanisms between genders (Allabadi et al., 2019).

Women are often more accustomed to expressing emotions such as fear and anxiety and are more likely to seek social support prior to undergoing medical procedures (Hadi et al., 2021). The ability to verbalize anxiety and receive emotional or social support from others may serve as a protective factor in reducing anxiety before catheterization. Some studies also indicate that women are more likely to accept and adapt to chronic health conditions such as heart disease, which contributes to better mental preparedness before invasive procedures (Kähkönen et al., 2017).

In contrast, men may internalize their anxiety and be reluctant to show vulnerability, which can increase psychological tension prior to the procedure. This difference should be taken into account when designing preoperative education and support approaches to ensure a more personalized and effective intervention (Sigdel et al., 2020).

Social Support and Preoperative Anxiety in Cardiac Catheterization Patients

Social support emerged as a significant protective factor against preoperative anxiety in this meta-analysis. Patients who perceived stronger emotional or interpersonal support were less likely to experience heightened anxiety prior to cardiac catheterization. Supportive environments may enhance patients' sense of security and coping capacity, thereby mitigating psychological distress before invasive procedures (Alexandri et al., 2017).

Emotional and informational support provided prior to the procedure can help patients better understand what to expect, reduce uncertainty, and improve their ability to manage stress. This directly contributes to a reduction in preoperative anxiety levels (Sembiring, 2019).

Conversely, a lack of social support may worsen the patient's perception of threat associated with the procedure, thereby increasing anxiety. Therefore, preoperative interventions should consider the patient's social context, including the involvement of family members in education and preparation (Afrassa et al., 2022).

Surgical History and Preoperative Anxiety in Cardiac Catheterization Patients

Previous surgical experience was also associated with reduced preoperative anxiety. Familiarity with hospital environments and procedural processes may lessen uncertainty and fear when patients face subsequent interventions. This finding suggests that prior exposure to surgical care can influence psychological preparedness for future procedures (Wang et al., 2019).

Having gone through surgery in the past can shape the perception that medical procedures are manageable, especially if the previous experience was smooth and free from complications. Trust in healthcare providers may also increase, which can contribute to reduced anxiety levels (Rouhi-Balasi et al., 2016).

On the other hand, patients without prior surgical experience often face greater anxiety, particularly regarding invasive procedures like catheterization. Thus, a positive surgical history may serve as a protective factor in managing preoperative anxiety (Phusanga, 2019).

Education and Preoperative Anxiety in Cardiac Catheterization Patients

Meta-analysis results indicate that higher education levels are associated with increased preoperative anxiety, particularly among patients scheduled for cardiac catheterization. Several studies show that patients with higher educational backgrounds experience greater anxiety than those with lower levels of education (Allabadi et al., 2019). This is not necessarily due to a lack of understanding, but rather a tendency among educated individuals to seek more detailed information about medical procedures.

This phenomenon is explained through the concept of coping styles, particularly the "monitor" type—individuals who feel more secure when provided with as much information as possible. Patients with higher education levels are more likely to belong to this group. However, when the information provided is perceived as insufficient, overly technical, or not aligned with their expectations, it may trigger increased anxiety (Hadi et al., 2022).

As a comparison, (Hadi et al., 2022) also described the "blunter" type—individuals who avoid excessive information because it may amplify their sense of threat. Patients with lower education levels often fall into this category and tend to feel calmer when not overwhelmed with complex technical explanations. For these individuals, providing overly detailed information may actually heighten preoperative tension.

Therefore, the impact of education on preoperative anxiety cannot be separated from an individual's coping style. In clinical practice, pre-procedural communication strategies should be tailored to patient characteristics. Educational approaches that align with the preferences and needs of both monitor- and blunter-type patients will be more effective in reducing anxiety and improving mental readiness prior to cardiac catheterization.

CONCLUSION

This study show that female gender, high social support, and a history of surgery are protective factors that reduce preoperative anxiety. Conversely, higher educational level increases the risk of preoperative anxiety among patients undergoing cardiac catheterization.

Based on the meta-analysis results, it is recommended that healthcare professionals conduct pre-operative anxiety screening, taking into account identified risk and protective factors. Patients with higher education levels should receive an adaptive and targeted communication approach to prevent excessive anxiety due to information overload or high risk perception. Strong social support from family and the surrounding community should be maximized, including involving patients with previous surgical experience as a source of peer support. Future research can focus on exploring the mechanisms of the relationship between education level and anxiety, as well as developing educational interventions tailored to patient characteristics to reduce pre-operative anxiety.

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AUTHOR CONTRIBUTION

JTA, as the principal investigator, was responsible for designing and determining the research topic, as well as conducting the search and selection of articles. SA contributed by providing input during the data analysis process, while RK was involved in drafting and editing the manuscript until it was ready for publication.

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DATA AVAILABILITY STATEMENT

Data analyzed using Review Manager (RevMan) 5.3 software, including extracted effect sizes and heterogeneity statistics, are available in the Figshare repository at: https://doi.org/10.6084/m9.figshare.30513839

CONFLICT OF INTEREST STATEMENT :
The authors declare that there is no conflict of interest in this study.

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