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Prevalence and factors associated with preoperative anxiety among patients undergoing surgery in low-income and middle-income countries: a systematic review and meta-analysis

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ABSTRACT

Objectives This review aimed to determine the pooled prevalence of preoperative anxiety and its associated factors among patients undergoing surgery in low/middle-income countries (LMICs).

Methods We searched PubMed, SCOPUS, CINAHL, Embase and PsychINFO to identify peer-reviewed studies on the prevalence and factors associated with preoperative anxiety among patients undergoing surgery using predefined eligibility criteria. Studies were pooled to estimate the prevalence of preoperative anxiety using a random-effect meta-analysis model. Heterogeneity was assessed using I^2 statistics. Funnel plot asymmetry and Egger's regression tests were used to check for publication bias.

Result Our search identified 2110 studies, of which 27 studies from 12 countries with 5575 participants were included in the final meta-analysis. Of the total 27 studies, 11 used the State-Trait Anxiety Inventory to screen anxiety, followed by the Amsterdam Preoperative Anxiety and Information scale, used by four studies. The pooled prevalence of preoperative anxiety among patients undergoing surgery in LMICs was 55.7% (95% CI 48.60 to 62.93). Our subgroup analysis found that a higher pooled prevalence of preoperative anxiety was found among female surgical patients (59.36%, 95% CI 48.16 to 70.52, I^2=95.43, p<0.001) and studies conducted in Asia (62.59%, 95% CI 48.65 to 76.53, I^2=97.48, p<0.001).

Conclusion Our meta-analysis indicated that around one in two patients undergoing surgery in LMICs suffer from preoperative anxiety, which needs due attention. Routine screening of preoperative anxiety symptoms among patients scheduled for surgery is vital.

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Strengths and limitations of this study

- ► Conducting abroad literature search, independent screening, quality appraisal and data extraction by two investigators represent the main strength of the current review.
- ► The absence of significant publication bias increases the reliability of our findings.
- ► The significant heterogeneity among studies and the restriction applied to include studies published only in English language are the major limitations of the current review in generalising these findings to all low-income and middle-income countries.

INTRODUCTION

Anxiety is defined as a subjective state of emotional uneasiness, distress, apprehension or fearful concern associated with autonomic and somatic features and causes impaired functioning or activity.[1] Anxiety can also be a normal emotional human reaction to circumstances of danger accompanied by physiological and psychological elements.[1 2] Surgery is one of the standard medical procedures that could increase anxiety irrespective of the type of surgery.[2 3] Surgery is a life-threatening procedure that causes the person to perceive himself under a direct physical restraint. Patients scheduled for surgery may experience fears and anxieties such as nervousness, fear of being unable to wake up from anaesthesia, fear of postoperative pain and fear of death.[4] As a result, preoperative anxiety is becoming a significant mental health problem for many patients undergoing surgery.[5 6]

Different epidemiological studies revealed the varying magnitude of preoperative anxiety among patients undergoing surgery. For example, a global level systematic review and meta-analysis reported a 48% pooled prevalence of preoperative anxiety among patients undergoing surgery.[7] A facility-based study conducted in Netherland found 27.9% and 20.3% of preoperative anxiety in patients undergoing hip and knee surgery, respectively.[8] Epidemiological studies conducted in low/middle-income countries (LMICs) found that the prevalence of preoperative anxiety ranges from 47% to 70.3% in India,[9 10] 62% to 97% in Pakistan[11–13] and 39.8% to 70% in Ethiopia.[5 14–18]

The magnitude of preoperative anxiety among patients undergoing surgery varies depending on the reasons and type of surgery, gender of the patient,[12] patient interaction with medical staff, previous experience of surgical procedures and sensitivity to stressful circumstances.[19 20] Also, factors such as fear of surgery, fear of anaesthesia, sociodemographic characteristics of the patient (age, educational status and partner status), types of surgery, fear of postoperative pain and fear of death were significant predictors of preoperative anxiety.[16 17 21–25] However, the frequently mentioned major causes of preoperative anxiety were fear of the outcomes of surgery (29.3%), followed by fear of the progress after surgery (19.5%) and complications after surgery (11.4%).[26] Furthermore, evidence also indicated that in many LMICs, the potential effect of scarce resources at health facilities, weak health systems and culture of a given community could play a paramount role in the increased rates of preoperative anxiety among surgical patients. For example, studies demonstrated that waiting for a longer duration for surgery,[27 28] inadequate information about the procedure, disrespect by the clinician, lacking empathy[29] and receiving less inpatient care[28] could increase the risk of preoperative anxiety. Globally, the surgery rate ranges from 295 operations per 100 000 population in Ethiopia to 23 369 per 100 000 in Hungary, indicating a considerable difference in surgical service provision between low-income countries (LIC) and high-income countries (HIC) despite a growing unmet need.[30] Despite the small number of surgical service in LMICs, it is compounded by the burden of managing postoperative complications such as delayed complications which mainly caused by inadequate inpatient care and low rates of follow-up service.[31]

Increased preoperative anxiety levels may be a reason for patients to decline planned surgical procedures.[32 33] High levels of preoperative anxiety negatively affect the surgical operation and contribute to adverse surgical outcomes.[34 35] Literature showed that preoperative anxiety might cause slow, complicated and painful postoperative recovery.[35–37] Severe levels of anxiety before the surgical procedure have resulted in autonomic disturbances such as increased heart rate, raised blood pressure and arrhythmias,[38] and affecting the outcomes of surgical procedures.[39] Before the surgical procedure, patients who developed anxiety were found to require higher doses of anaesthetic medications, had a higher level of postoperative pain, increased consumption of analgesic drugs, increased morbidity, prolonged recovery and hospital stay.[40–42] Appropriate management of anxiety by clinicians may provide a better preoperative assessment, less pharmacological premedication, smoother induction and maybe even better outcome.[43]

Based on the above evidence there was a substantial difference in the reported prevalence of preoperative anxiety among patients undergoing surgery across studies. Also, there is no previously conducted systematic reviews and meta-analysis on the topic of interest, particularly in LMICs. Furthermore, identifying the significant correlates of preoperative anxiety is vital to reduce the burden or prevent the onset and subsequent consequences. Therefore, this review aimed to examine the prevalence and thematically quantify and present factors associated with preoperative anxiety among patients undergoing surgery in LMICs and formulate recommendations for future healthcare services in the area.

METHODS

Search strategy

A systemic review and meta-analysis was conducted using studies that examined the prevalence and factors associated with preoperative anxiety among patients undergoing surgery in LMICs. The strategy for literature search, selection of studies, data extraction and reporting of results for the current review was designed following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines[44] (online supplemental file 1).

Five electronic databases (PubMed, SCOPUS, CINAHIL, Embase and PsychINFO) were systematically searched to identify studies that report the prevalence of preoperative anxiety among patients undergoing surgery in LMICs. Searching in PubMed was performed using the following terms: ((Prevalence OR Magnitude OR Epidemiology OR Incidence OR Estimates OR Burden OR Associated factors OR Determinants OR Correlates OR Predictors) AND ((Preoperative Anxiety OR Anxiety OR Anxiety symptoms OR Anxiety disorder OR General Anxiety disorder) AND (Surgical patients OR patients undergoing surgery OR surgery)). Database-specific subject headings associated with the above terms were used to screen studies indexed in SCOPUS, CINAHIL, Embase and PsychINFO databases. Besides, we observed the reference lists of published studies to identify potential other relevant articles for this review. The whole search strategy of our review is presented in online supplemental file 2.

Eligibility criteria

In the current review, we have included observational studies conducted on determining the prevalence and factors associated with preoperative anxiety among patients undergoing surgery in LMICs, and written in English language. Eligible studies included for this review had to fulfil the following criteria: first, the type of study has to be observational (cross-sectional, nested case–control, cohort studies or follow-up studies). Second, the study participants were patients (age ≥18 years) who have a schedule to undergo surgical procedures under anaesthesia, regardless of their sex. Third, measurement of anxiety was done using standard diagnostic criteria or a validated screening tools. Fourth, the studies should be from a LMIC. World Bank Atlas classified countries as low-income and middle-income for those with the Gross National Income per capita of ≤$1025 and between $1026 and $12 375, respectively (https://data.worldbank.org/indicator/NY.GNP.PCAP.CD).

Studies that reported pooled preoperative anxiety, had a poor quality score on the Newcastle Ottawa Scale (NOS), duplicate studies, conference proceedings, commentaries, reports, short communications and letters to editors were excluded. Then full-text articles were independently checked for their eligibility by two investigators (AB and NM). Disagreements were resolved by discussing with a third author (BD) for the final selection of studies.

Data extraction and study quality assessment

Data were extracted using a specific form designed to extract data that authors developed. The data extraction form included the following information: name of the author, year of publication, country, study design, sample size, type of surgery and the number of positive cases for preoperative anxiety, prevalence of preoperative anxiety and significant factors associated with preoperative anxiety. AB conducted the primary data extraction, and then NM assessed the extracted data independently. Any disagreements and discrepancies were resolved through discussion with the third author BD.

The methodological qualities of each included article were assessed by using a modified version of the NOS.[45] The methodological quality and eligibility of the identified articles were independently evaluated by two reviewers (AB and NM), and disagreements among reviewers were resolved through discussion with the third Author (BD). The summary of the agreed level of bias and level of agreement between independent evaluators of studies is mentioned in online supplemental file 3. Finally, studies with a scale of ≥5 out of 10 were included in the current review.

Data analysis

For the first objective, estimating the pooled prevalence of preoperative anxiety, the prevalence report extracted from all the included primary studies were meta-analysed. For the second objective, identifying the significant factors associated with preoperative anxiety, reports of measures of associations (OR, r, β or RR) were presented using narrative synthesis. The narrative synthesis was conducted per the approaches indicated on the Conduct of Narrative Synthesis in Systematic Reviews.[46] While interpreting the association between significant factors and preoperative anxiety, adjusted estimates were the first choice. However, for studies that missed reporting adjusted estimates, crude estimates were considered.

We have examined publication bias by visual inspection of a funnel and conducting Egger's regression tests.[47 48] A p value <0.05 was used to declare the statistical significance

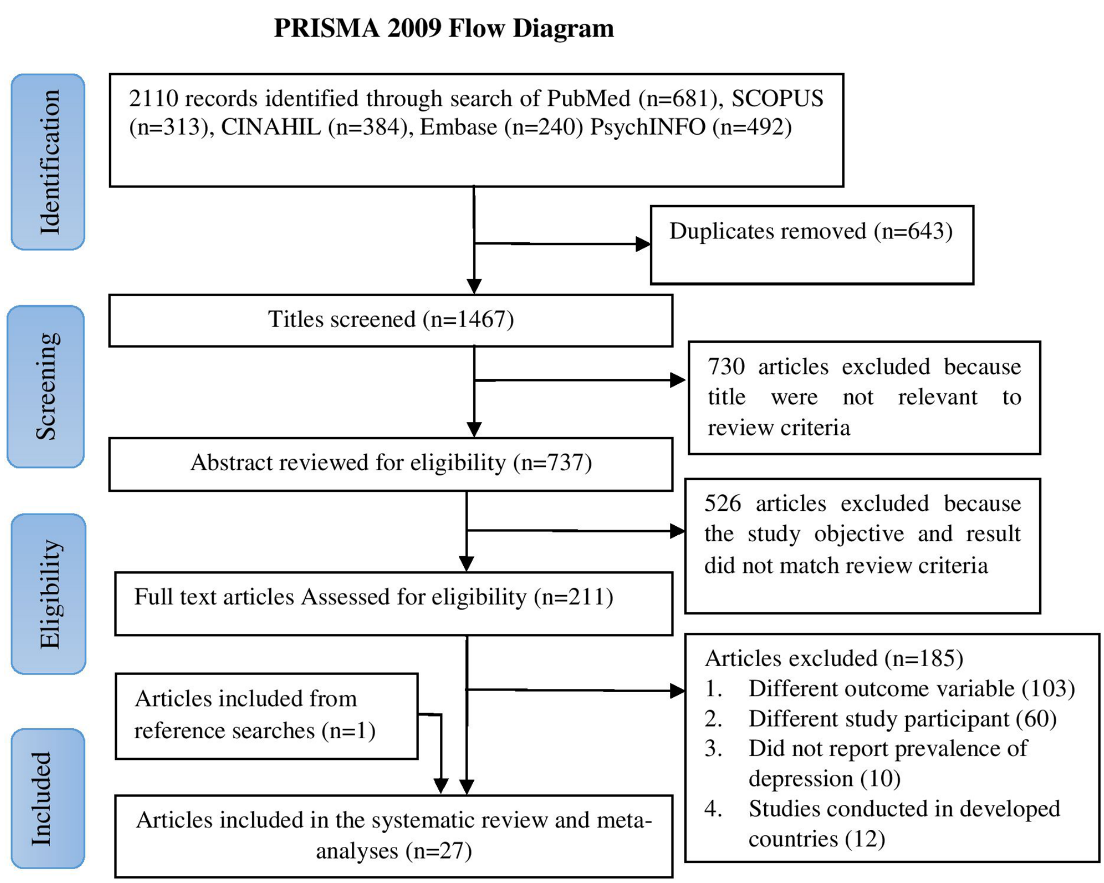

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart of the study identification process for systematic reviews and meta-analyses.

of publication bias. Studies were pooled to estimate pooled prevalence and 95% CI using a random-effect model.[49] We have assessed heterogeneity using Cochran's Q and the I² statistics.[50] I^2 statistics is used to quantify the percentage of the total variation in the study estimate due to heterogeneity. I^2 values of 25, 50% and 75% were considered to represent low, medium and high heterogeneity, respectively.[51] Due to significant heterogeneity across studies, we conducted a subgroup analysis using moderators such as methodological quality of studies, country, gender, anxiety assessment tool, economic level of a country and region where a country located. Also, sensitivity analysis was conducted to evaluate the presence of outlier estimates of preoperative anxiety. All the extracted data were analysed using STATA V.16.

Patient and public involvement

No patient or public involved in the current review.

RESULTS

Identification of studies

We have identified a total of 3110 studies from five databases in our initial electronic searching. After removing duplicates, reviewing titles and abstracts, 211 studies were considered eligible for full-text review. After excluding

Table 1 Characteristics of studies included in the current systematic review

Author	Publication year	Country	Sample size	Study design	Type of surgery	Cases	Prevalence (%)	Anxiety measures (cut-off point)
Bedaso and Ayalew[14]	2019	Ethiopia	407	Cross-sectional	All surgery	191	47	STAI (≥44/80)
Takele *et al*[15]	2019	Ethiopia	237	Cross-sectional	All surgery	132	56	PITI-20 Item (≥16/60)
Woldegerima *et al*[16]	2018	Ethiopia	178	Cross-sectional	All surgery	106	60	STAI (≥44/80)
Mulugeta *et al*[17]	2018	Ethiopia	353	Cross-sectional	All surgery	215	61	STAI (>44/80)
Akinsulore *et al*[38]	2015	Nigeria	51	Cross-sectional	All surgery	26	51	STAI (>44/80)
Nigussie *et al*[5]	2014	Ethiopia	239	Cross-sectional	All surgery	168	70.3	STAI (≥44/80)
Ebirim and Tobin[60]	2010	Nigeria	125	Cross-sectional	All surgery	43	34	VAS (≥45/100)
Srahbzu *et al*[18]	2018	Ethiopia	423	Cross-sectional	Orthopaedic surgery	168	39.8	HADS-A (≥18)
Ryamukuru[52]	2017	Rwanda	151	Cross-sectional	All surgery	110	72.8	PITI-20 Item (≥15/60)
Zammit *et al*[53]	2018	Tunisia	332	Cross-sectional	All surgery	224	67.5	APAI score (>10)
Dagona[54]	2018	Nigeria	30	Cross-sectional	All surgery	16	53.3	APAI-H (NA)
Matthias and Samarasekera[64]	2011	Srilanka	100	Cross-sectional	Elective surgery	77	77	APAI score (≥11)
Carneiro *et al*[55]	2009	Brazil	96	Cross-sectional	Cardiac surgery	42	43.8	HADS-A (≥9)
Ramesh *et al*[63]	2017	India	140	Cross-sectional	Cardiac surgery	118	84	STAI (≥40/80)
Gonçalves *et al*[56]	2016	Brazil	106	Cross-sectional	Cardiac surgery	43	40.6	BAI (NA)
Alves *et al*[57]	2007	Brazil	114	Cross-sectional	Cosmetic surgery	85	74.5	STAI (>36/80)
Caumo *et al*[58]	2001	Brazil	591	Cross-sectional	Elective surgery	141	23.99	STAI (≥39/80)
Jafar and Khan[11]	2009	Pakistan	300	Cross-sectional	Elective surgery	186	62	STAI (NA)
Maheshwari and Ismail[12]	2015	Pakistan	154	Cross-sectional	Elective CS	112	72.7	VAS (≥50)
Ali *et al*[69]	2013	Turkey	80	Cross-sectional	Gall bladder surgery	31	38.75	BAI (>17/63)
Ya'akba and Vachkova[71]	2017	Palestine	320	Cross-sectional	All surgery	184	57.5	APAI score (>11)
Tajgna and Krishna[62]	2018	India	160	Cross-sectional	All surgery	140	87.5	DASS-21 (NA)
Xu *et al*[72]	2016	China	53	Cross-sectional	Gastric cancer surgery	11	20.75	HADS-A (≥18)
Santos *et al*[59]	2014	Brazil	41	Cross-sectional	Rectal surgery	16	39	BAI (≥10/63)
Khalili *et al*[65]	2019	Iran	231	Cross-sectional	All surgery	109	47.2	STAI (≥40/80)
Kanwal *et al*[61]	2018	Pakistan	363	Cross-sectional	All surgery	228	62.8	VAS (≥45/100)
Tajgna *et al*[62]	2017	India	200	Cross-sectional	Emergency CS	110	55	STAI (≥40/80)

APAI, Amsterdam Preoperative Anxiety and Information Scale; BAI, Beck Anxiety Inventory; CS, caesarean section; DASS-21, Depression Anxiety and Stress Scale; HADS, Hospital Anxiety and Depression Scale; PITI, Preoperative Intrusive Thought Inventory; STAI, State-Trait Anxiety Inventory; VAS, Visual Analogue Scale.

185 articles in full-text review and adding 1 article that we get through reference searching, 27 studies were included in this systematic review and meta-analysis (figure 1).

Characteristics of included studies

Of the total 27 studies (5575 population), all (100%) studies employed cross-sectional study design, and 9 (81.2%) studies published in the past 5 years.[14–18 38 52–54] Also, six studies were conducted in Ethiopia,[5 14–18] five studies were from Brazil[55–59] and three studies were from each of the following countries: Nigeria,[38 54 60] Pakistan[11 12 61] and India.[61–63] The sample size of the included studies ranges from 30 in Nigeria[54] to 591 in Brazil.[58] The prevalence of preoperative anxiety ranges from 34% in Nigeria[60] to 87.5% in India.[62] Of the 27 included studies, 16 (59.2%) were from middle-income countries, whereas 11 (40.8%) were from LICs. State-Trait Anxiety Inventory (STAI) is the most common tool used to screen anxiety (11 studies), followed by the Amsterdam Preoperative Anxiety and Information Scale (APAI) (4 studies) (table 1).

Methodological quality of studies

We used the modified NOS[45] to evaluate the methodological quality of the studies included in the current review. Among the 27 studies included in the present review, 16 studies were of high (NOS score ≥8) and 11 studies were of moderate methodological quality (NOS score 6–7) (online supplemental file 4).

Meta-analysis

The pooled prevalence of preoperative anxiety among patients undergoing surgery within the LMICs included within this study was estimated to be 55.7% (95% CI 48.60 to 62.93) with considerable heterogeneity between studies (I^2=97%; p<0.001). Consequently, a random-effects meta-analysis model was employed to estimate the overall pooled prevalence (figure 2).

Further, to explore the possible sources of heterogeneity we employed a random-effect univariate meta-regression model considering the sample size, publication year and NOS quality score as moderators. However, none these continuous variables (ie, sample size (coefficient=−0.015, p=0.533), publication year (coefficient=0.984, p=0.202)

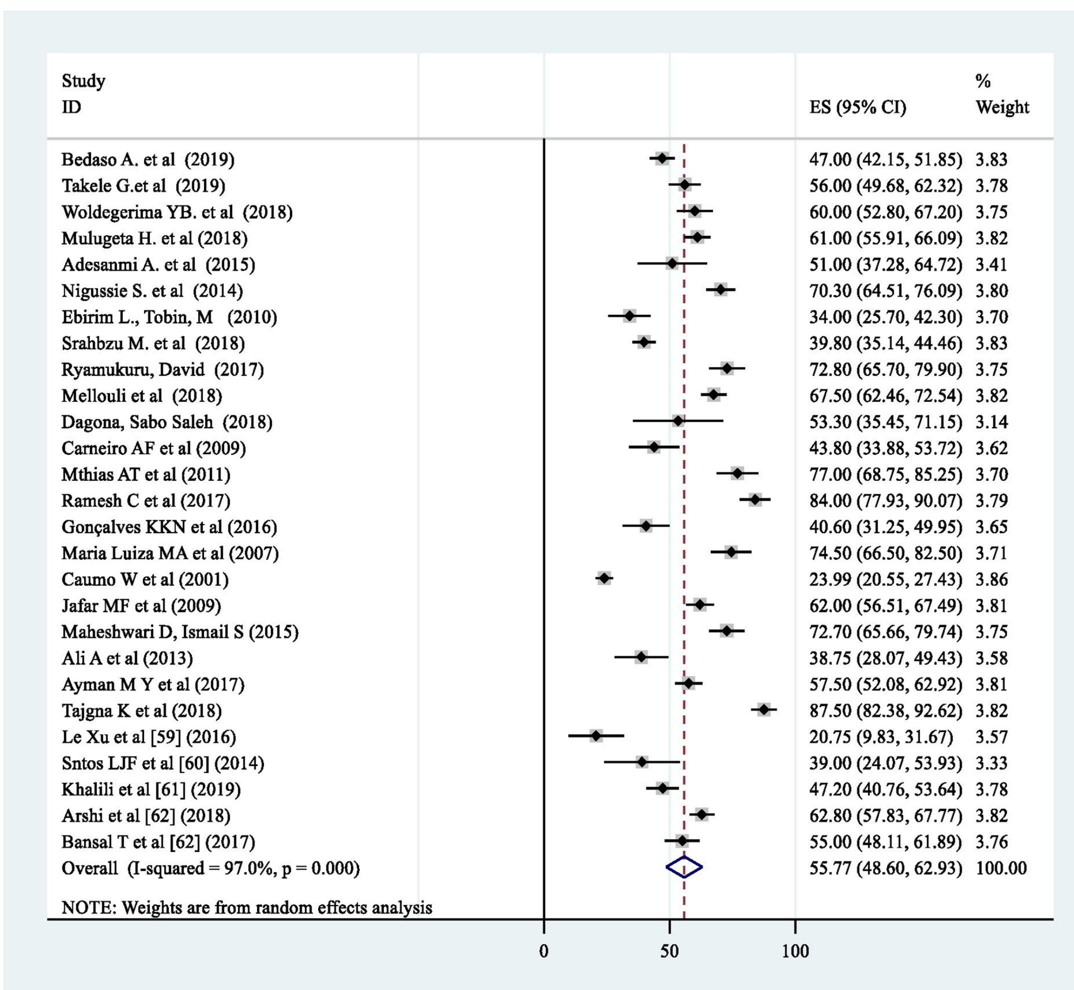

Figure 2 Forest plot showing the pooled prevalence of preoperative anxiety among patients undergoing surgery in low-income and middle-income countries. ES, effect size.

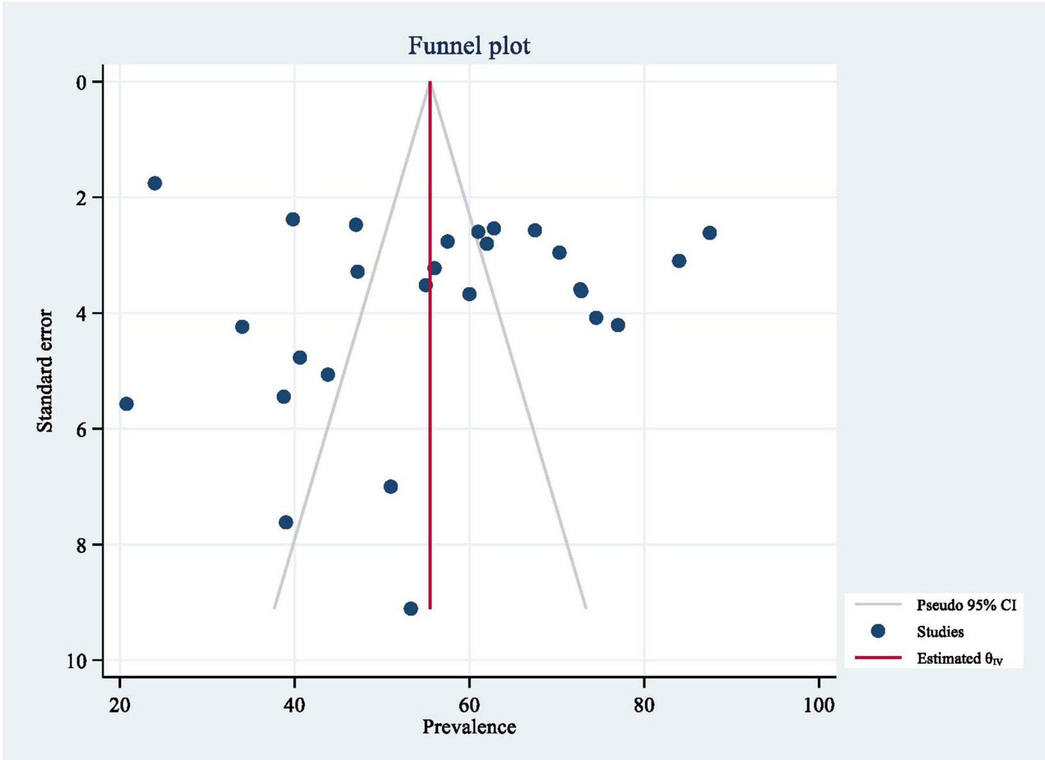

Figure 3 Funnel plot for testing publication bias (random effect model, N=27).

and NOS quality score (coefficient=−2.65, p=0.412)) found to have significant association with heterogeneity.

Publication bias

Inspection of the funnel plot looks symmetric and shows no significant publication bias (figure 3). Besides, eggers regression test suggested absence of publication bias (B=−2.79, SE=2.013, p=0.165).

Sub-group and sensitivity analysis

Due to the reported high heterogeneity index among studies, a subgroup analysis was conducted using characteristics like country, type of anxiety tool used, quality of studies and economic level of a country. Among studies that assessed the prevalence of preoperative anxiety among surgical patients, the subgroup analysis based on the region where the studies conducted revealed that a higher pooled prevalence of preoperative anxiety was reported in a study conducted in Asia (62.59%, 95% CI 48.65 to 76.53, I^2=97.48, p<0.001), followed by Africa (55.91%, 95% CI 48.37 to 63.44 I^2=99.31, p<0.001) and Middle East (52.5%, 95% CI 42.41 to 62.59). Besides, a higher pooled prevalence of preoperative anxiety was reported in a study that used Depression Anxiety and Stress Scale (DASS) (87.5%, 95% CI 82.37 to 92.62), followed by studies that used APAI tool as an anxiety assessment tool (64.9%, 95% CI 55.78 to 74.10, I^2=83.4%, p<0.001).

To further explore the source of heterogeneity among studies included in the review, we have also conducted a subgroup analysis using the quality of studies as a moderator. The pooled prevalence of preoperative anxiety was higher in the studies with moderate methodological quality (57.2%) (95% CI 48.49 to 65.97, I^2=94.2%, p<0.001) compared with those studies with high methodological quality (54.8%) (95% CI 44.28 to 65.28, I^2=97.8, p<0.001). Furthermore, a pooled estimate of preoperative anxiety among female surgical patients (59.36%, 95% CI 48.16 to 70.52, I^2=95.43, p<0.001) was higher than their male counterparts (45.95%, 95% CI 31.69 to 60.21, I^2=96.67, p<0.001). However, a pooled estimate of preoperative anxiety in middle-income countries (55.7%) (95% CI 48.60 to 62.93, I^2=98, p<0.001) was comparable to studies conducted in LICs (54.9%, 95% CI 47.69 to 62.17, I^2=92.6, p<0.001) (table 2).

Moreover, we have conducted a leave-one-out sensitivity analysis to identify the influence of one study on the overall pooled estimate. The overall estimate of this study did not appear to be affected by the removal or addition of a single study at a time, suggesting the robustness of our pooled estimate. Thus, the pooled prevalence of preoperative anxiety ranges from 54.5% to 57.2% (figure 4).

Factors associated with preoperative anxiety among patients undergoing surgery

The results extracted from studies conducted on factors associated with preoperative anxiety among patients undergoing surgery are presented in online supplemental file 5. Associated factors that have been adjusted in the studies included in this review were inconsistent across studies conducted in LMICs.[5 12 14–18 52 53 56 58 59 63–68]

Table 2 Subgroup analysis of the prevalence of preoperative anxiety among patients undergoing surgery by country, type of anxiety tool, quality of studies and economic level of a country

Subgroup	Number of studies	Estimates		Heterogeneity across studies	
		Prevalence (%)	95% CI	I^2 (%)	P value
Country					
Ethiopia	6	55.6	35.13 to 44.46	94.1	<0.001
Nigeria	3	44.6	31.86 to 58.16	69.6	0.037
Rwanda	1	72.8	65.7 to 79.89	–	–
Tunisia	1	67.5	62.46 to 72.53	–	–
Brazil	5	44.4	23.76 to 64.95	97.1	<0.001
Srilanka	1	77	68.75 to 85.25	96.6	<0.001
India	3	75.6	56.72 to 94.49	69	0.040
Pakistan	3	65.4	59.4 to 71.39	–	–
Turkey	1	38.8	28.07 to 49.4	–	–
Palestine	1	57.5	52.08 to 62.9	–	–
China	1	20.6	9.83 to 31.67	–	–
Iran	1	47.2	40.76 to 53.63	97	<0.001
Anxiety tool used					
STAI	11	57.8	45.80 to 69.78	97.9	<0.001
PITI	2	64.3	47.85 to 80.78	91.7	0.001
VAS	3	56.6	37.16 to 76.17	96.1	<0.001
HADS-A	3	35.3	23.77 to 46.90	82.6	0.003
APAI	4	64.9	55.78 to 74.10	83.4	<0.001
BAI	3	39.6	33.29 to 46.02	0	0.964
DASS	1	87.5	82.37 to 92.62	–	–
Quality of studies					
High	16	54.8	44.28 to 65.28	97.8	<0.001
Moderate	11	57.2	48.49 to 65.97	94.2	<0.001
Economy level of a country					
Low income	11	54.9	47.69 to 62.17	92.6	<0.001
Middle income	16	55.7	48.60 to 62.93	98	<0.001
Gender					
Male	8	45.95	31.69 to 60.21	96.67	<0.001
Female	9	59.36	48.16 to 70.52	95.43	<0.001
Region					
Africa	11	55.91	48.37 to 63.44	99.31	<0.001
Asia	9	62.59	48.65 to 76.53	97.48	<0.001
South America	5	44.35	27.62 to 61.08	95.54	<0.001
Middle East	2	52.50	42.41 to 62.59	82.63	0.02

APAI, Amsterdam Preoperative Anxiety and Information Scale; BAI, Beck Anxiety Inventory; DASS, Depression Anxiety and Stress Scale; HADS, Hospital Anxiety and Depression Scale; PITI, Preoperative Intrusive Thought Inventory; STAI, State-Trait Anxiety Inventory; VAS, Visual Analogue Scale.

Of the total studies included in the review, 10 studies[15 17 18 56 58 63–66 68] reported the increased odds of preoperative anxiety symptoms among female patients when compared with male patients. Similarly, being young age[12 16 52 65 67] has significantly increased the odds of preoperative anxiety symptoms in patients waiting for scheduled surgery. Preoperative anxiety was significantly associated with fear of death, dependency, and disability.[14 16]

Further, patients who did not receive adequate preoperative information were more likely to have clinically significant preoperative anxiety levels compared with patients who did receive high-level information.[5 12 15 17 53 65] Not surprisingly, low income appeared to increase the odds of developing preoperative anxiety symptoms in patients waiting for surgery.[5 12] Likewise, having a family history of mental illness,[45] history of cancer and smoking,[49] lower

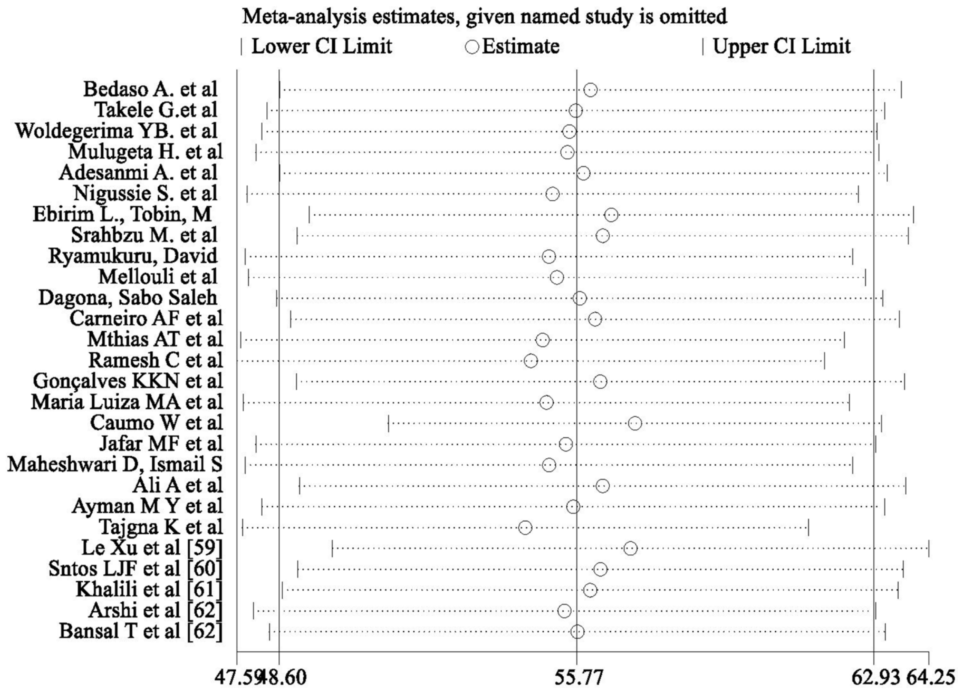

Figure 4 Sensitivity analysis for studies included in the meta-analysis.

educational attainment[66 67] were found to be associated with preoperative anxiety symptoms in patients waiting for surgery.

Moreover, statistical adjustment for some other risk factors varied for respective studies included in this review. Factors such as getting low social support, fear of unexpected outcome of surgery,[14] being non-partnered,[5] urban residence, inadequate awareness of anaesthesia adverse effect,[65] number of days of hospitalisation,[69] having a chronic medical illness,[18] gastrointestinal problems[59] were found to have a significant positive correlation with preoperative anxiety after adjusting for other factors.

DISCUSSION

This systematic review and meta-analysis synthesised the results of 27 primary studies that were conducted in LMICs to determine the pooled prevalence and factors associated with preoperative anxiety among 5575 surgical patients undergoing surgery.

The pooled prevalence of preoperative anxiety among patients undergoing surgery in LMICs was 55.7%. The pooled estimate in the current review was higher when compared with the pooled prevalence reported in a global level systematic review and meta-analysis that included 14652 study participants (48%).[7] Likewise, the pooled estimate of our review was higher than the estimates from different epidemiological studies conducted in HICs such as the Netherlands reported that 27.9% and 20.3% of patients undergoing hip and knee surgery, respectively, experienced anxiety symptoms before the actual surgery.[8] The variation in the demographic characteristics of participants and may partly explain the observed difference in the pooled estimates. Furthermore, risk factors such as genetic make-up of individuals, access to information regarding their surgical procedure, quality and availability of service in each health facility, sampling methods, and tools used to screen anxiety may contribute to the observed difference.

Surprisingly, the available epidemiological evidence was virtually unchanged when the origin of the primary studies included in this review considered as a moderator. For example, the pooled prevalence of preoperative anxiety was 77% in Sri Lanka, 75.6% in India and 72.8% in Rwanda. Although evidence suggests that an individual cultural background could potentially affect the experience of anxiety symptoms, the variability of the origin of primary studies appeared to play a negligible role in the pooled estimate of this study.

The subgroup analysis using the tools used to estimate the prevalence of preoperative anxiety showed a slight variation in the prevalence of preoperative anxiety among patients undergoing surgery. Most notably, the prevalence of preoperative anxiety among patients undergoing surgery was slightly higher in the studies that have used DASS to ascertain preoperative anxiety in patients when compared with APAI. The discrepancy may be due to variability in the psychometric properties of those measures.

Our review found that the prevalence of preoperative anxiety was higher among female surgical patients compared with their male counterparts. Also, of the studies included in the current systematic review and meta-analysis, 10 studies reported that being female increased the odds of developing preoperative anxiety among surgical patients.[15 17 18 56 58 63–66 68] This might be because of women's experience of some specific forms of mental health problems like premenstrual dysphoric disorder, postpartum depression and postmenopausal mental illness, which are linked with changes in ovarian hormones that may contribute to the observed difference in risk of developing preoperative anxiety among female patients.[70]

Early screening and targeted intervention of preoperative anxiety among patients undergoing surgery are recommended for future action. Further studies should be conducted to examine the possible reasons for a substantially higher burden of preoperative anxiety among patients undergoing surgery. Moreover, interventional and randomised controlled trials (RCTs) are recommended for a specific group of surgical patients.

It is worth noting the following potential limitations of our review in generalising the findings. First, there is significant heterogeneity among studies included in the current review. Second, the restriction to include studies published only in English language could introduce possible selection bias and limit the generalisability to all LMICs.

CONCLUSION

Our study indicated that around one in two patients undergoing surgery in LMICs suffer from preoperative anxiety, which needs due attention. Therefore, routine screening of preoperative anxiety among patients scheduled for surgery is vital. In addition, providing preoperative education on the effect of anaesthesia, surgical procedure and possible postoperative pain management options is highly warranted. Due to the significant heterogeneity across the studies, future studies should examine preoperative anxiety for a specific group of surgical patients by stratifying the possible associated factors. Moreover, since all the included studies employed a cross-sectional study design, the findings did not show a temporal relationship between preoperative anxiety and its associated factors. Therefore, future longitudinal studies and RCTs are recommended.

Contributors All authors contributed to the design of this review. AB performed the search, quality appraisal, data extraction, analyses and writing the draft manuscript. NM participated in the searching, quality appraisal, data extraction and revising of the draft manuscript. BD participated to the consensus, analyses and revising the draft manuscript. All authors accepts official responsibility for the overall integrity of the manuscript. All authors read and approved the final manuscript for publication.

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