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REVIEW ARTICLE

Top 50 cited articles on propofol use in anesthesia induction: efficacy, safety, and innovations: bibliometric analysis

Ghaida Hamdi[1*], Jana Alnahdi[1], Leen Alotaig[2], Lama Alqahtani[3], Mawaddah Almadhi[4], Turky Alsubahi[5]

ABSTRACT

Background: Propofol is a cornerstone of modern anaesthesia. Despite extensive research, the landmark studies shaping its clinical use remain unmapped. This study aimed to identify and analyse the top 50 most-cited articles on propofol in anaesthesia to highlight evolutionary trends and influential contributions.

Methods: A bibliometric analysis was conducted using Web of Science with the keywords "propofol" and "anaesthesia." Articles were screened for relevance to efficacy and safety. The top 50 articles were selected based on citation count. Data on citations, metrics, geography, and study design were extracted and analysed descriptively.

Results: The 50 papers accumulated 5,252 citations (mean = 104.1). Randomised controlled trials predominated (46%), while systematic reviews were limited (8%). Geographically, 66% of the publications originated from Europe, indicating a significant regional concentration.

Conclusion: This analysis confirms propofol's central role in anaesthesia while revealing critical gaps in data synthesis and global representation. The reliance on European-centric data limits universal applicability. Future research should focus on multinational collaborations and high-quality systematic reviews to establish globally diverse and safer induction protocols.

Keywords: Propofol, anesthesia, induction, bibliometric analysis.

Introduction

Anaesthesia plays a crucial role in reducing pain and anxiety. Among the available techniques, intravenous general anaesthesia is widely preferred due to its rapid onset, precise control over the depth of sedation, and minimal residual effects [1]. Propofol is an intravenous anesthetic widely used for the induction and maintenance of general anaesthesia, total intravenous anaesthesia, procedural sedation, and intensive care unit sedation [2].

It is a short-acting agent with a favorable induction profile, rapid clearance, and swift penetration of the blood–brain barrier. These characteristics allow for rapid onset and recovery. Pharmacologically, propofol exhibits strong sedative, hypnotic, and anxiolytic effects, but minimal analgesic activity [3-5].

The exact mechanism of action of propofol remains unclear; however, it is primarily attributed to positive allosteric modulation of gamma-aminobutyric acid type A receptors, enhancing inhibitory neurotransmission in the central nervous system. Additional laboratory evidence suggests potential anti-inflammatory and antioxidant effects [6].

The effectiveness and safety profile of propofol-induced sedation are well documented [7-9]. However, its use is associated with adverse effects such as apnea, cardiovascular depression, injection pain, and, rarely, infusion syndrome, highlighting the need for safer alternatives with comparable benefits [10-12].

Although extensive research has clarified its pharmacology, efficacy, and adverse effects, limited

Correspondence to: Ghaida Hamdi
*College of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia.
Email: ghidhamdi@gmail.com
Full list of author information is available at the end of the article.
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efforts have been made to consolidate the most highly cited studies guiding clinical practice and innovation in anaesthesia induction. Furthermore, bibliometric analyses remain limited in addressing emerging trends such as safety evaluation, development of novel analogues, electroencephalography (EEG) guided dosing approaches, and real-world effectiveness across diverse populations.

In regional and national anaesthesia literature, including several high-impact studies conducted in Saudi Arabia, comparisons among different commercial propofol formulations have demonstrated equivalent induction quality when assessed using the bispectral index (BIS) and hemodynamic parameters, while highlighting cost as a key determinant in clinical decision-making [13].

To the best of our knowledge, no previous study has analysed the top 50 most cited articles on propofol use in anaesthesia induction with respect to efficacy, safety, and innovation. Therefore, this study was undertaken to address this gap. This study aims to evaluate the characteristics and quality of the top 50 cited articles, focusing on efficacy, safety, and innovation, while identifying emerging research trends in the field.

Methods

Search strategy and study selection

A comprehensive literature search was conducted using the Web of Science Core Collection database, which is well recognised for its robust citation indexing and suitability for bibliometric analyses [14].

As shown in Figure 1, the search initially retrieved 1,036 records. The keywords “propofol” and “anaesthesia” were used in combination with Boolean operators to identify relevant publications, with no restrictions applied regarding the year of publication to ensure comprehensive coverage of the literature. Citation analysis was conducted by ranking Web of Science records according to total citation counts, and a citation-based filtering approach was used to identify the 100 most-cited records for screening, consistent with established bibliometric and citation analysis approaches [15].

Title and abstract screening of the 100 records was conducted independently by four reviewers based on predefined inclusion criteria (relevance to propofol induction, peer-reviewed articles, and English-language

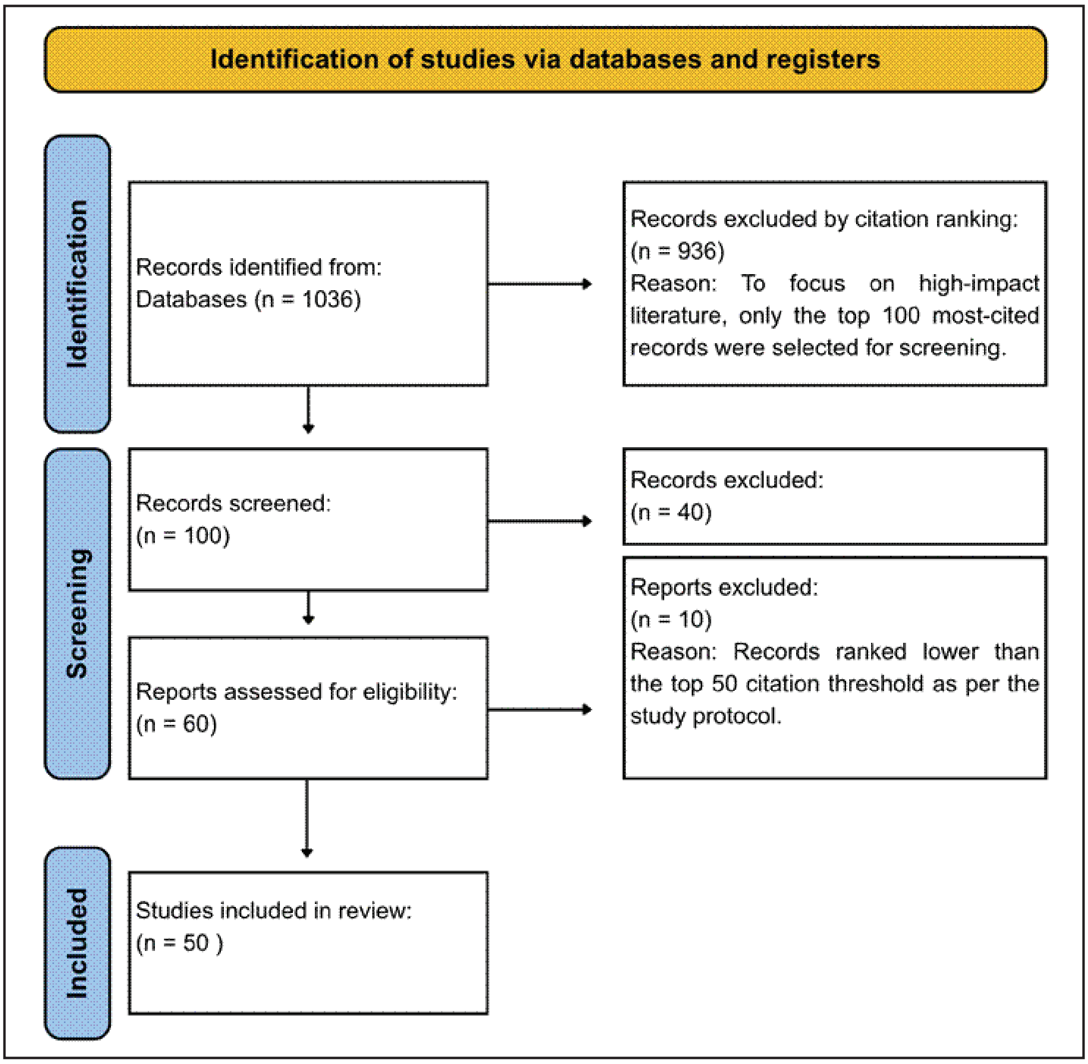

Figure 1. *PRISMA flow diagram of included and excluded records.*

publications). Disagreements were resolved through discussion, and a fifth reviewer was consulted when necessary.

Following screening, 40 studies were excluded based on eligibility criteria. The remaining eligible studies were further assessed, and the 50 most-cited articles were included in the final bibliometric analysis.

A PRISMA 2020 compliant flow diagram was used to report the study selection process, including identification, screening, eligibility, and inclusion stages, to ensure transparency and reproducibility [16].

Data extraction

Data extraction was performed independently by four reviewers using a standardised data extraction form adapted and modified from established bibliometric methodology [15]. Extracted variables included total citations, annual citation rates, journal impact factors, first author, year of publication, study design, level of evidence, and country or region of origin, consistent with established bibliometric indicators commonly reported in performance analysis studies [15]. Any discrepancies were resolved through discussion until consensus was reached among the reviewers.

Statistical analysis and visualisation

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 30.0 (IBM Corp., Armonk, NY, USA).

Descriptive statistics were used to summarise study characteristics. Continuous variables were reported as mean, median, and range, while categorical variables were presented as frequencies and percentages. Citation patterns and temporal trends were analysed and visualised to describe the evolution of research in propofol induction [16].

Results

Bibliometric overview of the top-cited propofol induction literature

As shown in Table 1, citation counts demonstrated a highly skewed distribution, with values ranging from 217 to 58 citations. A clear separation was observed between the top-ranked studies (Ranks 1-10 = 217-138 citations) and the remaining articles (Ranks 11-50 = 135-58 citations), indicating the presence of a small number of highly influential publications.

Table 1. *Top 50 most-cited studies on propofol induction: title, first author, year of publication, and total citation count.*

Rank	Title	First author	Year of publication	Total citations
1	Pharmacokinetic-Pharmacodynamic Model for Propofol for Broad Application in Anesthesia and Sedation	D. J. Eleveld	2018	217
2	Relationship Between Calculated Blood Concentration of Propofol and Electrophysiological Variables During Emergence from Anesthesia: Comparison of BIS, Spectral Edge Frequency, Median Frequency, and Auditory Evoked Potential Index	M. Doi	1997	208
3	Propofol Anesthesia and Postoperative Nausea and Vomiting: Quantitative Systematic Review of Randomized Controlled Studies	M. Tramèr	1997	205
4	Effects of Fentanyl, Alfentanil, Remifentanil, and Sufentanil on Loss of Consciousness and BIS During Propofol Induction of Anesthesia	C. Lysakowski	2001	200
5	Complexity of Multi-Dimensional Spontaneous EEG Decreases During Propofol-Induced General Anesthesia	Michael Schartner	2015	197
6	A Meta-Analysis of Nausea and Vomiting Following Maintenance of Anesthesia with Propofol or Inhalational Agents	J. R. Sneyd	1998	161
7	Cognitive Function after Sevoflurane- versus Propofol-Based Anesthesia for On-Pump Cardiac Surgery: A Randomized Controlled Trial	J. Schoen	2011	153
8	Effect of Propofol and Isoflurane Anesthesia on the Immune Response to Surgery	T. Inada	2004	153
9	Propofol Compared with Sevoflurane General Anesthesia Is Associated With Decreased Delayed Neurocognitive Recovery in Older Adults	Y. Zhang	2018	140
10	Granger Causality Analysis of Steady-State Electroencephalographic Signals During Propofol-Induced Anesthesia	Adam B. Barrett	2012	138
11	Influence of Nociceptive Stimulation on Analgesia Nociception Index During Propofol-Remifentanil Anesthesia	M. Gruenewald	2013	135
12	Effects of Propofol and Desflurane Anesthesia on The Alveolar Inflammatory Response to One-Lung Ventilation	T. Schilling	2007	133
13	Rapid Emergence does not Explain Agitation Following Sevoflurane Anesthesia in Infants and Children: A Comparison With Propofol.	Md. Ira Todd Cohen	2003	128
14	Propofol versus Inhalational Agents to Maintain General Anesthesia in Ambulatory and In-Patient Surgery: A Systematic Review and Meta-Analysis	Stefan Schraag	2018	127
15	Preoperative Anxiety and Pain Sensitivity are Independent Predictors of Propofol and Sevoflurane Requirements in General Anesthesia	H. K. Kil	2012	120
16	The Use of Propofol Infusions in Paediatric Anesthesia: A Practical Guide	Cs. Mcfarlan	1999	113

Continued

Rank	Title	First author	Year of publication	Total citations
17	Closed-Loop Control of Propofol Anesthesia Using BIS™: Performance Assessment in Patients Receiving Computer-Controlled Propofol and Manually Controlled Remifentanil Infusions for Minor Surgery	A. R. Absalom	2003	109
18	Cerebral Haemodynamic Changes During Propofol-Remifentanil or Sevoflurane Anesthesia: Transcranial Doppler Study Under BIS Monitoring	A. Conti	2006	107
19	A Comparison of Total Intravenous Anesthesia Using Propofol with Sevoflurane or Desflurane in Ambulatory Surgery: Systematic Review and Meta-Analysis	G. Kumar	2014	102
20	Comparison of Bispectral EEG Analysis and Auditory Evoked Potentials for Monitoring Depth of Anesthesia During Propofol Anesthesia	R. J. Gajraj	1999	100
21	A Large Simple Randomized Trial of Rocuronium Versus Succinylcholine in Rapid-Sequence Induction of Anesthesia Along with Propofol	J. I Andrews	1999	99
22	EEG BIS Monitoring in Sevoflurane or Propofol Anesthesia: Analysis of Direct Costs and Immediate Recovery	A. Yli-Hankala	1999	97
23	Closed-Loop Control of Propofol Anesthesia	G. N. C. Kenny	1999	95
24	Type of Anesthesia and Patient Quality of Recovery: a Randomized Trial Comparing Propofol-Remifentanil Total IV Anesthesia with Desflurane Anesthesia	W.-K. Lee	2015	93
25	Single-Breath Inhalation Induction of Sevoflurane Anesthesia With and Without Nitrous Oxide: A Feasibility Study in Adults and Comparison with an Intravenous Bolus of Propofol	J. E. Hall	1997	93
26	Comparison of Propofol and Fentanyl Administered at the End of Anesthesia for Prevention of Emergence Agitation after Sevoflurane Anesthesia in Children	M.-S. Kim	2013	91
27	Meta-Analytic Comparison of Prophylactic Antiemetic Efficacy for Postoperative Nausea and Vomiting: Propofol Anesthesia versus Omitting Nitrous Oxide versus Total IV Anesthesia with Propofol	M. Tramèr	1997	88
28	Incidence of Awareness in Total IV Anesthesia Based on Propofol, Alfentanil and Neuromuscular Blockade	O. Nordstr	1997	86
29	Magnesium as Part of Balanced General Anesthesia With Propofol, Remifentanil and Mivacurium: A Double-Blind, Randomized Prospective Study in 50 Patients	S. Schulz-Stuè Bner	2001	82
30	Propofol-Based Total Intravenous Anesthesia is Associated With Better Survival Than Desflurane Anesthesia in Hepatectomy for Hepatocellular Carcinoma: A Retrospective Cohort Study	Hou-Chuan Lai	2019	81
31	Pharmacodynamic Modelling of the BIS Response to Propofol-Based Anesthesia During General Surgery in Children	C. Jeleazcov	2008	79
32	Occurrence of and Risk Factors for Electroencephalogram Burst Suppression During Propofol-Remifentanil Anesthesia	G. Besch	2011	78
33	Propofol Infusion Syndrome in Anesthesia and Intensive Care Medicine	Axel Fudickar	2006	77
34	Targeting Smooth Emergence: the Effect Site Concentration of Remifentanil for Preventing Cough During Emergence During Propofol-Remifentanil Anesthesia for Thyroid Surgery	B. Lee	2009	77
35	Remifentanil and Propofol Without Muscle Relaxants or with Different Doses of Rocuronium for Tracheal Intubation in Outpatient Anesthesia	N. Schlaich	2000	75
36	A Comparison of BIS and Arx-Derived Auditory Evoked Potential Index in Measuring the Clinical Interaction Between Ketamine and Propofol Anesthesia	H. E. M. Vereecke	2003	75
37	Critical Involvement of the Thalamus and Precuneus During Restoration of Consciousness with Physostigmine in Humans During Propofol Anesthesia: A Positron Emission Tomography Study	G. Xie	2011	74
38	Age-Related Effects in The EEG During Propofol Anesthesia	A. Schultz	2004	74
39	Comparison of Changes in Jugular Venous Bulb Oxygen Saturation and Cerebral Oxygen Saturation During Variations of Hemoglobin Concentration Under Propofol and Sevoflurane Anesthesia	K. Yoshitani	2005	72
40	Systemic Administration of Lidocaine Reduces Morphine Requirements and Postoperative Pain of Patients Undergoing Thoracic Surgery after Propofol-Remifentanil-Based Anesthesia	Weihua Cui	2010	70
41	Unconscious Learning During Surgery with Propofol Anesthesia	C. Deeprose	2004	70
42	BIS-Guided Induction of General Anesthesia in Patients Undergoing Major Abdominal Surgery Using Propofol or Etomidate: A Double-Blind, Randomized, Clinical Trial	Am. Petrun	2013	69
43	General Anesthesia with Target Controlled Infusion of Propofol for Planned Caesarean Section: Maternal and Neonatal Effects of a Remifentanil-Based Technique	M. Van De Velde	2004	68
44	Recovery Characteristics of Sevoflurane- or Propofol-Based Anesthesia for Day-Care Surgery	J. Raeder	1997	68
45	BIS Monitoring During Propofol-Induced Sedation and Anesthesia	H. Singh	1999	66
46	Clinical Comparison of "Single Agent" Anesthesia with Sevoflurane Versus Target Controlled Infusion of Propofol	Kr. Watson	2000	65
47	Effects of Isoflurane and Propofol on Cortical Somatosensory Evoked Potentials During Comparable Depth of Anesthesia as Guided by BIS	Ehc. Liu	2005	63
48	Influence of Propofol-Based Total Intravenous Anesthesia on Peri-Operative Outcome Measures: A Narrative Review	Mg. Irwin	2020	62
49	Target-Controlled Propofol vs. Sevoflurane: A Double-Blind, Randomized Comparison in Day-Case Anesthesia	I. Smith	1999	61
50	A Comparison of Single-Dose Dexmedetomidine or Propofol on The Incidence of Emergence Delirium in Children Undergoing General Anesthesia for Magnetic Resonance Imaging	Cl. Bong	2015	58

Overall, the dataset demonstrated a total of 5,252 citations, with a mean of 105.0 citations per article and a median of 92. The h-index of the dataset was 50, reflecting both a strong concentration of highly cited "landmark" studies and a sustained mid-range citation impact across the included literature.

These findings suggest that propofol induction research is driven by a limited number of highly influential studies, alongside a broader body of moderately cited work contributing to clinical and methodological advancements.

Temporal distribution of the top-cited propofol induction studies

Figure 2 shows a relatively balanced distribution across decades, with equal representation in the 2000-2009 and 2010-2020 periods (n = 18; 36.0% each). This reflects sustained interest in refining propofol induction protocols during an era of advances in pharmacokinetic modelling, safety optimisation, and international collaboration.

The late 1990s accounted for 14 articles (28.0%), representing the formative stage in which propofol's clinical advantages were established across different surgical contexts.

Although the 2020s are not represented in this dataset, the distribution suggests that high-impact contributions emerged steadily over time rather than in a single innovation surge, indicating a continuous accumulation of practice-defining evidence over more than two decades.

Journal distribution of the top-cited propofol induction articles

Table 2 shows that nine journals are represented, indicating a strong concentration within a limited number of anaesthesia-focused outlets. The British Journal of Anaesthesia dominates the field, publishing 26 articles (52%) and accounting for the highest citation output, reflecting its central role in high-impact anaesthesia pharmacology research.

The next most frequent journals were Anaesthesia (n = 7) and Acta Anaesthesiologica Scandinavica (n = 6), followed by the European Journal of Anaesthesiology (n = 4).

Two journals, PLoS One (n = 2) and Paediatric Anaesthesia (n = 2), contributed more than one publication each. The remaining journals (BMC Anesthesiology, Current Opinion in Anesthesiology, and International Journal of Obstetric Anesthesia) each contributed a single article.

Overall, the findings demonstrate a clear concentration of influential propofol induction research within a small group of high-impact anaesthesia journals.

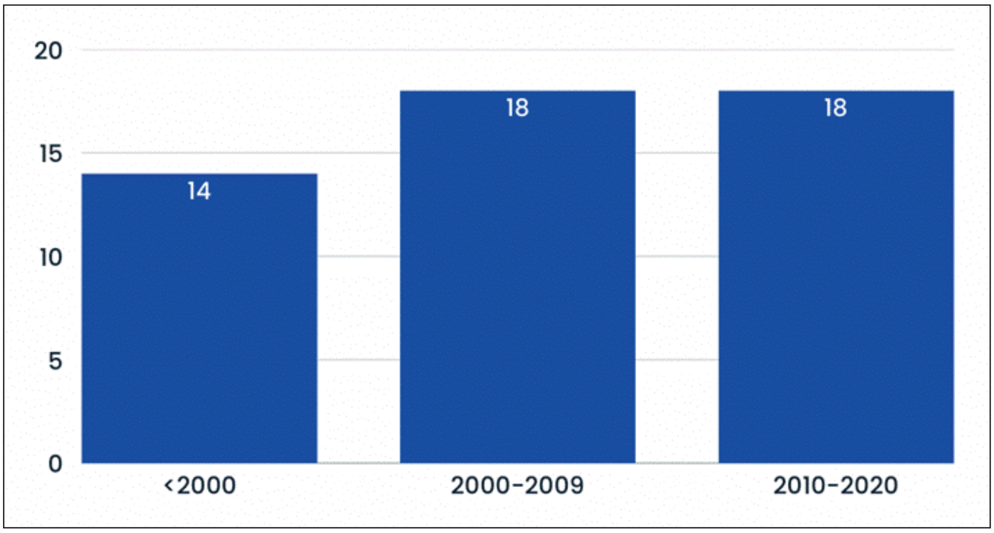

Figure 2. *Decade-wise distribution of the top 50 most-cited propofol induction studies.*

Table 2. *Distribution of included studies by journal, total citations, and impact factor.*

Rank	Journal	No. of papers	Total citations	2024 JCR impact factor
1	British Journal of Anesthesia	26	2922	9.2
2	Anesthesia	7	604	6.9
3	Acta Anesthesiologica Scandinavica	6	499	2.0
4	European Journal of Anesthesiology	4	379	6.8
5	PLoS One	2	335	2.6
6	Paediatric Anesthesia	2	241	1.7
7	Other journals (n = 3)	3	272	2.1 - 2.6

Geographic distribution of propofol induction research

As illustrated in Figure 3, the geographical analysis identified 50 country occurrences across the included studies, reflecting the extent of international collaboration. Each country appearing in a study's author affiliations was counted once; therefore, multi-country studies contributed multiple country occurrences. This approach captures the breadth of cross-national participation in propofol induction research beyond the number of included studies alone.

The United Kingdom was the leading contributor (n = 17; 34%), followed by Germany (n = 7; 14%). South Korea, China, and Japan each contributed three publications (n = 3; 6%). Belgium and Singapore each contributed two publications (n = 2; 4%).

Additional single-country contributions (n = 1; 2%) were observed from Finland, the Netherlands, France, Italy, Switzerland, Sweden, Denmark, Canada, the United States, New Zealand, and Taiwan.

Overall, the results demonstrate a wide international distribution, with a notable contribution from both European and Asian countries.

Evidence levels (Oxford CEBM Framework)

As shown in Table 3, the evidence distribution follows the Oxford Centre for Evidence-Based Medicine (CEBM) framework. Level I evidence, including systematic reviews, meta-analyses, and high-quality randomized controlled trials, accounted for 28 studies (56.0%). Level II evidence (n = 12; 24.0%) consisted of randomized controlled trials and well-designed comparative studies with control groups. Level III evidence (n = 2; 4.0%) included non-randomized prospective cohort studies, while Level IV evidence (n = 7; 14.0%) comprised case series and retrospective studies. Level V evidence (n = 1; 2.0%) included expert opinion and narrative reviews.

Study design profile

As presented in Figure 4, the study design profile shows that RCTs (n = 23; 46.0%) represent the most frequent study type among the top-cited literature. These are followed by prospective, non-randomized cohort, or observational studies (n = 17; 34.0%), and case series or retrospective studies (n = 4; 8.0%). Systematic reviews and meta-analyses (n = 4; 8.0%) are also present in the dataset. The remaining studies consist of expert opinion or guideline papers (n = 2; 4.0%).

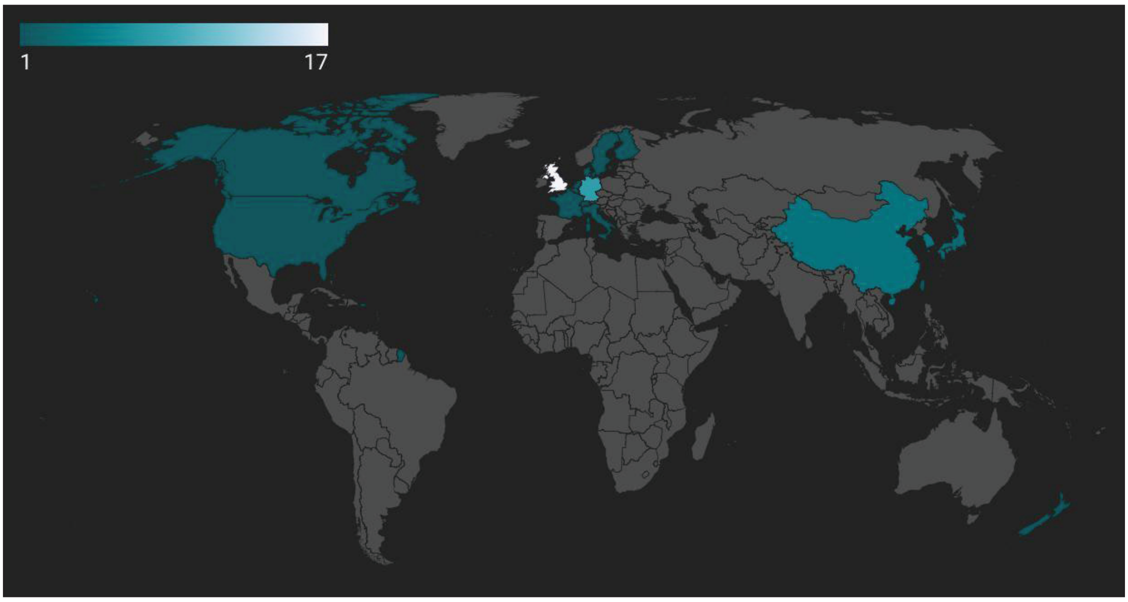

Figure 3. *Geographic distribution showing the top contributing countries.*

Table 3. *Level of evidence distribution according to Oxford CEBM categories of the top-cited propofol induction articles.*

Level of evidence	Number of articles (n = 50)	Percentage (%)
Level I	28	56.0
Level II	12	24.0
Level III	2	4.0
Level IV	7	14.0
Level V	1	2.0

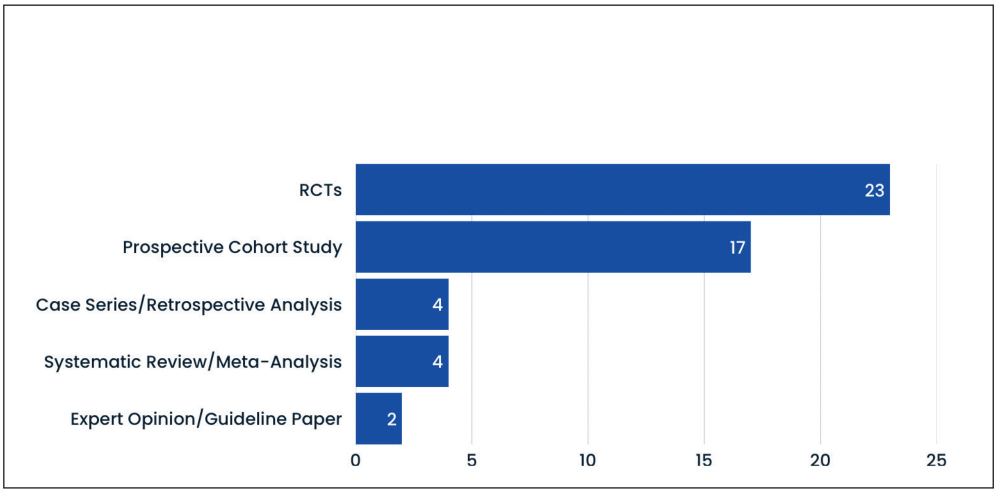

Figure 4. *Study design profile of the top-cited articles.*

Discussion

This bibliometric analysis of the top 50 cited articles on propofol use in anaesthesia induction highlights efficacy, safety, and innovations. To our knowledge, this is among the first bibliometric analyses examining propofol use in anaesthesia induction. It measures the influence of citations and the progression of the evidence, thereby validating its fundamental importance in contemporary anaesthesia. Propofol remains central to modern anaesthesia due to its favorable pharmacokinetic profile and versatility in induction and maintenance [17,18]. Our findings show that a cluster of highly cited pillar studies, notably RCTs focusing on dosage accuracy, comparative efficacy, and safety optimisation, significantly impact the field. For example, [19] established that propofol has antiemetic properties, and [20] examined opioid interactions during induction; however, a notable gap exists in Level I evidence. Despite the abundance of RCT data (46%), systematic reviews comprise only 8% of the literature, which impedes evidence-based standardization of propofol protocols. The right-skewed distribution of the citation curve (range: 217-58) reflects a heavy-tailed distribution, where the top 10% of articles garner 40% of total citations, a pattern that indicates a field dominated by a few landmark studies. After the top 10 papers, which have totals between 217 and 138, there is an apparent decline in citations. This pattern draws attention to key investigations that greatly affect debates on propofol induction's efficacy, dosage approaches, and induction process safety. The overall impact is substantial with 5,252 total citations, an average of 104.1 citations per article, a median of 91, and an h-index of 50. This demonstrates a mature field in which core pillars coexist with growing research to improve practice constantly. Seminal articles on pharmacokinetic–pharmacodynamic modelling [18] indicate the field's transition to evidence-based practice. The temporal distribution of articles throughout three discrete eras suggests continual refining rather than discontinuous change. The late 1990s studies, such as [19]'s work on Postoperative nausea and vomiting and [21]'s meta-analysis on the same topic, established criteria for assessing induction, efficacy, and safety. In the 2000s, this line of research gained traction through comparative trials, such as [20] investigation of opioid combinations with propofol for loss of consciousness. From 2010 to 2020, research increasingly focused on pharmacokinetic accuracy. The comprehensive pharmacokinetic-pharmacodynamic model developed by [18] received the highest citation count (217). The emphasis on pharmacokinetics from 2010 to 2020 coincides with the rise of precision anaesthetic approaches, drawing on early work in the late 1990s that established EEG monitoring as a cornerstone for measuring anaesthetic depth [22,23]. This time frame corresponds to the typical pharmaceutical research lifecycle, which includes first efficacy demonstrations, comparative effectiveness studies, and safety refinement. The observed geographic concentration is particularly notable, with 66% of publications originating from Europe. This geographic bias may limit the generalizability of dosing recommendations across diverse patient populations with varying genetic pharmacokinetic profiles, body compositions, and comorbidity patterns common in different regions. The underrepresentation of research from developing countries, where resource constraints may necessitate different anesthetic approaches, suggests potential gaps in evidence applicable to global clinical practice. This concentration raises fundamental questions about the global applicability of study findings, especially given the wide variation in anesthetic practice, patient populations, and healthcare systems among countries [23]. Generalisability is further restricted by the absence or underrepresentation of several world regions. South Korea has been noted as an emerging country contributing to research [24]. There is a significant number of publications in a few journals, with the BJA accounting for 26 of the 50 articles and receiving 2,914 citations. Beyond geographic disparities, examining methodological trends within the literature provides further insights into articles and publication patterns. Methodological quality is a critical determinant of the strength of scientific evidence. RCTs have played a fundamental role in developing evidence-based treatment guidelines, for example, determining appropriate doses for specific groups such as children [25]. However, very few studies were systematic reviews or meta-analyses (8%). This indicates a lack of studies that pool and summarize evidence. Although such studies would support more robust clinical decision-making and evidence-based guideline development [19], it was also noted that most of the evidence is based on Level I and Level II research (56% and 24%, respectively). However, 18% of the evidence comes from levels III and IV, such as observational studies or case reports. Despite the significant development in clinical trial design, observational studies remain very important, especially in cases where it is difficult or unethical to conduct randomised trials, such as critically ill patients or rare conditions [26]. This bibliometric study has several limitations, the most important of which are citation bias, geographic and methodological bias, and limitations in the scope of the analysis. Generalizing the results is difficult, as most studies were published in European countries, making it difficult to assess genetic variation. The results of the study may be influenced by geographic and methodological bias. Furthermore, the dominance of the British Journal of Anaesthesia further amplified this geographic bias. It skews the results to reflect European practitioners' and researchers' priorities and methodologies, ignoring valuable research published in other journals. The study also focused on the number of citations and did not analyse citation patterns, which may not fully reflect current research priorities or clinical relevance. The study did not include studies after 2020, which excluded recent developments in anaesthesia practice, such as changes related to the COVID-19 pandemic and new medical monitoring technologies. Lastly, the analysis reveals a lack of systematic reviews (8%), which may be unpublished or not indexed in the databases used. Observational studies, like [26], received fewer citations, possibly due to practical constraints rather than methodological preferences. Despite these limitations, the analysis sheds light on the foundational research that has shaped modern propofol induction practice, emphasizing the impact of pivotal studies on current protocols for vulnerable populations such as pediatric patients and pregnant women [25,27]. Bibliometric research on anaesthesia, such as that of [28], has yielded comparable results. Their findings are consistent with our investigation, which found that propofol-related literature predominantly centres on safety, pharmacokinetics, and sedation, with citations dominated by a few major publications. Their analysis echoes this, highlighting a similar thematic concentration and citation pattern of pharmacokinetics and sedation, with citations dominated by a few central articles and a diverse focus. These comparisons show that the gaps and clusters identified in this investigation are not isolated. Rather, these patterns reflect a broader trend in the anaesthesia literature, underscoring the importance of diversifying research sources and pooling evidence. Furthermore, our findings on the established role of propofol are corroborated by recent clinical evidence. For instance, a systematic review and meta-analysis by [29] confirmed that propofol remains a safe and effective standard for general anaesthesia induction and maintenance. While their study reveals that newer drugs, such as ciprofol, may improve specific recovery dynamics, it ultimately validates propofol's core and foundational position in modern anaesthesia practice, which is consistent with the influential status indicated by our bibliometric analysis.

Recommendations

Based on the findings of this bibliometric analysis, several directions for future research are proposed.

Future studies should prioritise large-scale, multinational collaborations, particularly involving underrepresented regions. This would enhance the external validity and global relevance of the evidence base in propofol research.

There is a need for a greater focus on high-quality systematic reviews and meta-analyses to better consolidate the existing body of clinical evidence derived from primary studies, particularly RCTs.

Future research should aim to strengthen the integration between primary clinical investigations and higher level evidence synthesis to improve the coherence and clinical applicability of propofol-related literature.

Conclusion

This bibliometric analysis provides a quantitative overview of the intellectual structure and temporal evolution of research on propofol induction over the past three decades. The findings indicate that propofol remains a cornerstone agent in anaesthetic practice, with a strong concentration of highly cited literature originating from European institutions and journals. RCTs represent the predominant study design among the most influential publications.

In addition, the analysis highlights a relative underrepresentation of evidence synthesis studies, such as systematic reviews and meta-analyses, within the most highly cited literature. The observed geographic concentration of research output may also have implications for the broader applicability of the available evidence across different populations and healthcare settings.

In summary, while the clinical effectiveness of propofol is well established, future progress in this field will depend on improving geographic diversity and strengthening evidence synthesis to support more comprehensive and globally applicable anaesthetic practice.

List of Abbreviations

BIS	Bispectral index
EEG	Electroencephalography
RCTs	Randomised controlled trials

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Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

Ethical approval

Not applicable (bibliometric analysis).

Author details

Ghaida Hamdi[1], Jana Alnahdi[1], Leen Alotaig[2], Lama Alqahtani[3], Mawaddah Almadhi[4], Turky Alsubahi[5]

1. College of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia
2. College of University for Applied medical Science, King Saud Bin Abdulaziz Health Sciences, Riyadh, Saudi Arabia
3. College of Applied Medical Science, King Saud Bin Abdulaziz University for Health Science, Riyadh, Saudi Arabia
4. Intensive Care Unit, Ministry of Health, Riyadh, Saudi Arabia
5. Assistant Professor - Adult Cardiothoracic Anesthesia & Critical Care Medicine, Department of Anesthesia and Critical Care, King Abdulaziz University, Jeddah, Saudi Arabia

Supplementary content (If any) is available online.

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