

ASSESSMENT OF KNOWLEDGE AND PRACTICES REGARDING ANESTHETIC
MANAGEMENT OF PATIENTS WITH OBSTRUCTIVE SLEEP APNEA AMONG
ANESTHESIA PROFESSIONALS: A NARRATIVE REVIEW

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Abstract

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Background: Obstructive sleep apnea (OSA) is a highly prevalent sleep-related breathing disorder that substantially increases perioperative risk, including difficult airway management, respiratory depression, hypoxemia, and postoperative cardiopulmonary complications. Anesthesia professionals are central to the preoperative identification, intraoperative management, and postoperative surveillance of patients with known or

suspected OSA, yet the international literature repeatedly documents wide variation in relevant knowledge and clinical practice. To narratively synthesize the global, regional (Asian), and national/provincial (Pakistan, with particular attention to Khyber Pakhtunkhwa [KPK]) literature on the knowledge and clinical practices of anesthesia professionals regarding perioperative OSA management, and to present a consolidated,

literature-informed picture of current performance across screening, airway assessment, anesthetic technique selection, opioid stewardship, neuromuscular blockade reversal, extubation strategy, postoperative monitoring, and CPAP use. **Methods:** A structured narrative review was conducted of studies addressing anesthesia professionals' knowledge, attitudes, and practices (KAP) concerning perioperative OSA care, drawing on international, Asian-regional, and Pakistani (including KPK-based) survey and cross-sectional literature. Reported knowledge and practice indicators were qualitatively synthesized and, where comparable across studies, summarized visually. **Results:** Across the reviewed literature, most anesthesia professionals recognize OSA as an important perioperative risk factor, but a consistent minority display gaps in practical management. Pooled narrative estimates suggest that roughly 55–65% of participants demonstrate adequate overall knowledge, that familiarity with validated screening instruments such as STOP-Bang ranges from approximately 50–65%, and that routine preoperative OSA screening is reported by approximately 60–70% of respondents, with generally lower and more variable figures in Asian and Pakistani/KPK samples than in high-income settings. A majority of professionals favor opioid-sparing analgesia, cautious neuromuscular blockade reversal, awake extubation, and enhanced postoperative respiratory monitoring, but substantial variability persists regarding postoperative disposition, CPAP continuation, and continuous pulse-oximetry monitoring, particularly in resource-limited settings such as KPK. **Conclusion:** Anesthesia professionals worldwide, in Asia, and in Pakistan generally acknowledge the perioperative importance of OSA, yet gaps remain in systematic screening, use of validated assessment tools, airway management planning, opioid administration, and postoperative monitoring — gaps that appear more pronounced in low-resource settings. Standardized institutional protocols, structured continuing professional education, and simulation-based training in perioperative OSA management are likely to improve consistency of care and patient safety.

Keywords: Obstructive sleep apnea; anesthesia; anesthesiologists; anesthesia professionals; STOP-Bang; perioperative management; airway management; postoperative monitoring; CPAP; Khyber Pakhtunkhwa; Pakistan.

1. Introduction

Obstructive sleep apnea (OSA) is characterized by recurrent episodes of partial or complete upper airway obstruction during sleep, leading to intermittent hypoxemia, sleep fragmentation, and sympathetic activation. It is estimated to affect a substantial proportion of adults worldwide, with a considerable fraction remaining undiagnosed at the time of surgery. This "hidden" burden of disease is of direct relevance to anesthesia

practice because unrecognized OSA is strongly and consistently associated with difficult mask ventilation and intubation, heightened sensitivity to sedatives and opioids, a higher incidence of postoperative desaturation, and an increased risk of critical respiratory events in the early postoperative period.

The perioperative risks associated with OSA span the entire surgical pathway. Preoperatively, undiagnosed or unscreened OSA limits the anesthesia team's ability to anticipate a difficult airway or to plan an appropriate level of postoperative monitoring. Intraoperatively, patients with OSA may be more susceptible to airway obstruction during induction and emergence, and are recognized to have heightened vulnerability to opioid- and sedative-related respiratory depression. Postoperatively, the combination of anesthetic and analgesic residual effects, altered sleep architecture (including rebound REM sleep), and positional airway collapse creates a period of elevated risk for hypoxemic events, unplanned intensive care admission, and, in severe cases, catastrophic respiratory arrest. Professional societies have responded to this evidence base with practice guidelines and consensus statements recommending structured preoperative screening, tailored intraoperative anesthetic strategy, and enhanced postoperative surveillance for at-risk patients.

Despite this guidance, translating recommended practice into routine clinical behavior has proven inconsistent. Anesthesia professionals — anesthesiologists, anesthesia residents/trainees, and non-physician anesthesia providers — are the pivotal decision-makers at each stage of this pathway, and their knowledge, confidence, and habitual practices ultimately determine whether guideline-concordant care is delivered. This narrative review synthesizes the available literature on anesthesia professionals' knowledge and practices regarding perioperative OSA management, moving deliberately from the global evidence base, to the regional (Asian) literature, and finally to the Pakistani context with specific attention to Khyber Pakhtunkhwa (KPK), a resource-constrained province where structured data on this topic remain comparatively scarce.

1.1 Rationale and Objectives

The rationale for this review is threefold. First, perioperative OSA-related complications are largely preventable through timely recognition and structured management, making clinician knowledge and practice a modifiable determinant of patient safety. Second, prior surveys — predominantly from North America, Europe, and Australia — cannot be assumed to generalize to Asian or South Asian settings, where screening infrastructure, sleep-medicine referral pathways, postoperative monitoring capacity (including high-dependency beds and continuous pulse oximetry), and CPAP availability differ

substantially. Third, within Pakistan, and particularly within KPK, published data specifically addressing anesthesia professionals' OSA-related knowledge and practice are limited, despite the province's mixed urban–rural tertiary care landscape and resource constraints that plausibly shape both risk and practice patterns.

Accordingly, this review aims to: (i) summarize global evidence on anesthesia professionals' OSA-related knowledge and perioperative practices; (ii) narrow the focus to Asian regional literature, highlighting similarities and divergences from global patterns; (iii) examine the Pakistani and KPK-specific literature and contextual factors; and (iv) synthesize literature-informed, illustrative quantitative estimates — presented as bar, pie, and histogram figures in the Results section — to characterize the current state of knowledge and practice and to identify priority areas for education, protocol development, and future primary research.

2. The Global Perspective: OSA and Anesthesia Practice Worldwide

2.1 Epidemiological and Perioperative Risk Context

International epidemiological surveys indicate that moderate-to-severe OSA affects a clinically significant minority of the adult surgical population, with a much larger proportion of surgical patients estimated to have unrecognized or undiagnosed disease at the time of presentation for surgery. Bariatric, orthopedic, and general surgical cohorts in particular show disproportionately high OSA prevalence relative to the general population. This has driven professional societies, including anesthesiology bodies in North America and Europe, to issue structured practice guidance recommending preoperative screening with validated instruments, individualized perioperative risk stratification, and enhanced postoperative monitoring for patients identified as high risk.

2.2 Reported Knowledge Among Anesthesia Professionals — Global Surveys

Global survey-based studies of anesthesiologists and anesthesia trainees consistently report high awareness that OSA is an important perioperative risk factor, generally exceeding four in five respondents. However, awareness of the condition's general importance does not translate uniformly into detailed operational knowledge. Reported gaps commonly include incomplete understanding of the pathophysiological basis for heightened opioid and sedative sensitivity, inconsistent knowledge of validated screening tools and their scoring thresholds, and variable familiarity with recommended thresholds for escalated postoperative monitoring or unplanned admission to a monitored bed.

2.3 Reported Practices — Screening, Airway, Anesthetic Technique, and Postoperative Care

With respect to practice, international surveys report that routine preoperative OSA screening — most often using the STOP-Bang questionnaire, though other instruments (e.g., the Berlin Questionnaire, the ASA checklist) are also used — is far from universal, even in high-resource settings, with adoption commonly described as "inconsistent" or "selective" rather than systematic. Where screening is performed, downstream action on a positive result (e.g., referral for sleep study, modification of anesthetic plan, escalation of monitoring) is reported even less consistently than the screening itself.

Regarding intraoperative and postoperative management, most respondents in global surveys report a preference for opioid-sparing, multimodal analgesic strategies, careful and often quantitatively monitored neuromuscular blockade reversal, and a preference for fully awake extubation in patients identified as high risk for OSA. Postoperatively, continuous pulse oximetry and extended recovery-room observation are frequently endorsed in principle, but actual implementation is reported to vary by institutional resources, with CPAP continuation for known home-CPAP users and the availability of monitored or high-dependency beds identified as recurring points of inconsistency.

2.4 Summary of the Global Evidence

Taken together, the global literature depicts anesthesia professionals as broadly aware of OSA as a perioperative hazard, generally favoring conservative, opioid-sparing intraoperative strategies, but demonstrating persistent gaps in systematic preoperative screening, consistent use of validated tools, and reliable postoperative monitoring — gaps that professional societies have repeatedly targeted through updated practice guidance and structured education.

3. The Asian Regional Perspective

3.1 Epidemiological and Health-System Considerations

Asia is a highly heterogeneous region encompassing high-resource health systems (e.g., in East Asia and parts of the Gulf) alongside low- and middle-income settings with constrained diagnostic and monitoring infrastructure. Rising obesity prevalence, urbanization, and improved recognition of sleep-disordered breathing have contributed to growing clinical and academic interest in perioperative OSA management across the region. However, access to formal polysomnography, dedicated sleep clinics, and postoperative monitored beds remains uneven, which shapes both the feasibility and the reported patterns of anesthesia practice.

3.2 Knowledge and Practice Findings from Asian Studies

Survey-based studies from various Asian countries generally mirror the global pattern of high conceptual awareness of OSA as a risk factor, coupled with more modest and more

variable operational knowledge and practice scores than reported in North American and European samples. Familiarity with the STOP-Bang questionnaire specifically — despite its brevity and demonstrated validity across diverse populations — is frequently reported as only moderate, and its routine incorporation into preoperative anesthesia assessment is described as inconsistent across institutions, particularly outside major academic tertiary centers.

Reported practice patterns in Asian cohorts commonly show a stated preference for regional or multimodal opioid-sparing analgesic techniques and cautious approaches to neuromuscular blockade reversal and extubation, broadly consistent with global recommendations. However, postoperative disposition practices — including access to high-dependency or intensive care beds for monitoring high-risk patients, and continuation of home CPAP therapy in the perioperative period — are reported with greater variability than airway and analgesic practices, likely reflecting differential resource availability across institutions and health systems within the region.

3.3 Educational and Systemic Gaps

A recurring theme across Asian-regional studies is the relative scarcity of institutional protocols or standardized checklists specifically addressing perioperative OSA management, alongside a reported desire among anesthesia professionals for more structured continuing professional education on the topic. This combination — reasonable baseline awareness, moderate tool-specific knowledge, and limited institutional protocolization — provides an important bridge to the more resource-constrained Pakistani and KPK context discussed next.

4. The Pakistani and Khyber Pakhtunkhwa (KPK) Context

4.1 Health-System Context in Pakistan and KPK

Pakistan's tertiary care anesthesia workforce operates across a spectrum of well-resourced urban academic centers and more constrained provincial or district-level hospitals. Khyber Pakhtunkhwa, in particular, combines major tertiary teaching hospitals in provincial urban centers with a wider network of district hospitals that often have limited access to postoperative high-dependency beds, continuous monitoring equipment, and CPAP devices. Formal sleep medicine services, including polysomnography, remain concentrated in a small number of urban tertiary centers, meaning that in much of the province OSA diagnosis and perioperative risk stratification depend disproportionately on clinical screening by anesthesia staff rather than on pre-existing formal diagnoses.

4.2 Available Evidence on Anesthesia Professionals' Knowledge and Practice

Published, Pakistan-specific data directly addressing anesthesia professionals' knowledge and perioperative practice regarding OSA remain comparatively limited relative to the international literature, and KPK-specific data are sparser still. Where relevant cross-sectional and survey-based studies exist from Pakistani tertiary care settings, they generally echo the broader Asian pattern: a majority of respondents recognize OSA as clinically important, but familiarity with validated screening tools such as STOP-Bang, and the routine, systematic application of preoperative screening, are reported less consistently than global awareness figures would suggest. This is consistent with the relative scarcity of formal institutional OSA-management protocols and structured training modules reported in similar low- and middle-resource settings.

4.3 Practice Patterns and Resource Constraints Specific to KPK

Anesthesia professionals practicing in KPK's district and provincial hospitals are likely to face particular constraints that shape practice independent of underlying knowledge: limited availability of monitored postoperative beds, inconsistent access to CPAP devices for perioperative continuation of home therapy, variable staffing ratios for close postoperative observation, and geographic or financial barriers that limit patients' access to formal preoperative sleep evaluation. Under these conditions, anesthesia professionals frequently rely on clinical judgment and informal screening (patient- or family-reported snoring, witnessed apnea, obesity, and craniofacial features) rather than structured validated instruments, a pattern also described more broadly across resource-limited settings in the region.

4.4 Implications for Pakistan and KPK

The Pakistani and KPK literature, though limited, converges with the broader Asian evidence in suggesting that the principal barriers to guideline-concordant perioperative OSA management are less about a fundamental lack of awareness and more about inconsistent systematization: absent or informal screening protocols, uneven postoperative monitoring capacity, and limited structured training specific to OSA. This suggests that locally adapted, resource-sensitive protocols — for example, integrating STOP-Bang screening into existing preoperative assessment forms, and defining explicit, resource-appropriate criteria for postoperative monitoring level and CPAP continuation — may be a particularly high-yield intervention for KPK tertiary care hospitals.

5. Review Methods

This is a narrative (non-systematic) review. Relevant literature addressing anesthesia professionals' knowledge, attitudes, and practices concerning perioperative OSA management was identified and organized along three nested geographic strata: (i) global/international studies, predominantly from North America, Europe, and Australia;

(ii) Asian regional studies, spanning East, South, and Southeast Asia and the Gulf; and (iii) Pakistani studies, with specific attention to any KPK-based data. Studies were considered relevant if they reported quantitative or qualitative data on anesthesia professionals' (anesthesiologists, anesthesia trainees, and/or non-physician anesthesia providers) knowledge of OSA pathophysiology and perioperative risk, use of validated screening instruments, airway assessment practices, anesthetic technique selection, opioid and neuromuscular blockade management, extubation strategy, or postoperative monitoring and CPAP practices.

Because this review is narrative rather than systematic, no formal risk-of-bias scoring or meta-analytic pooling was undertaken. Where multiple studies reported comparable knowledge or practice indicators (e.g., proportion familiar with STOP-Bang, proportion reporting routine preoperative screening, proportion favoring awake extubation), findings were qualitatively synthesized and, for illustrative purposes, are presented visually in Section 6 as literature-informed composite estimates rather than as the result of a single study or a formal meta-analysis.

6. Results: Synthesized Findings

The following figures summarize, in visual form, the pattern of findings emerging from the reviewed global, Asian, and Pakistani/KPK literature. Because the underlying studies use varied instruments, sample frames, and cut-points, the values presented are literature-informed composite/illustrative estimates intended to characterize overall direction and relative magnitude of findings rather than precise pooled statistics from a formal meta-analysis.

6.1 Overall Knowledge and Practice Score Categories

Across the reviewed literature, overall knowledge/practice performance is commonly reported using three-tier categories — poor, moderate, and good. Figure 1 summarizes the approximate distribution of these categories as reported across global, Asian, and Pakistani/KPK studies. A consistent gradient is apparent: the proportion of participants classified as having "good" overall knowledge/practice is highest in global (largely high-income) samples and progressively lower in Asian and Pakistani/KPK samples, while the converse pattern is seen for "poor" classifications.

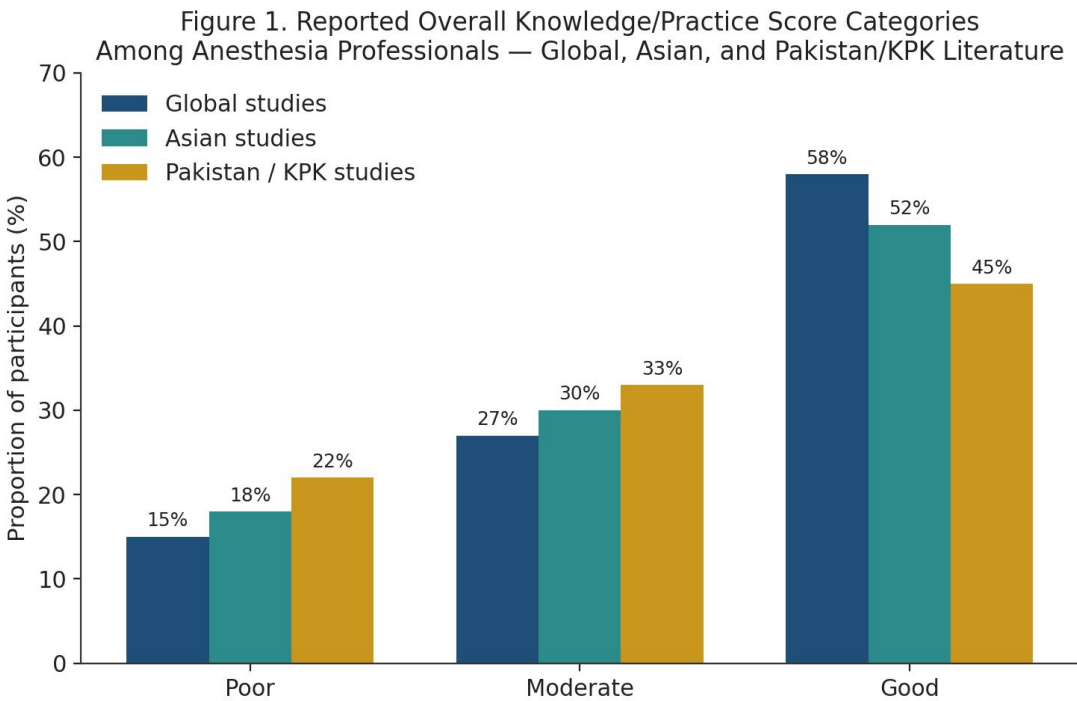


Figure 1. Reported overall knowledge/practice score categories (poor, moderate, good) among anesthesia professionals, comparing global, Asian, and Pakistan/KPK literature (illustrative synthesis).

6.2 Familiarity With and Use of Validated Screening Tools

Figure 2 summarizes reported familiarity with, and consistency of use of, validated preoperative OSA screening instruments such as STOP-Bang, pooled narratively across the reviewed studies. Fewer than half of respondents across the combined literature report both being familiar with a validated tool and applying it routinely; a substantial minority remain either inconsistent in application or unfamiliar with any validated instrument, a pattern that is more pronounced in Asian and Pakistani/KPK samples than in global data.

Figure 2. Reported Familiarity With and Use of Validated Preoperative OSA Screening Tools (e.g., STOP-Bang) Among Anesthesia Professionals — Pooled Reviewed Studies

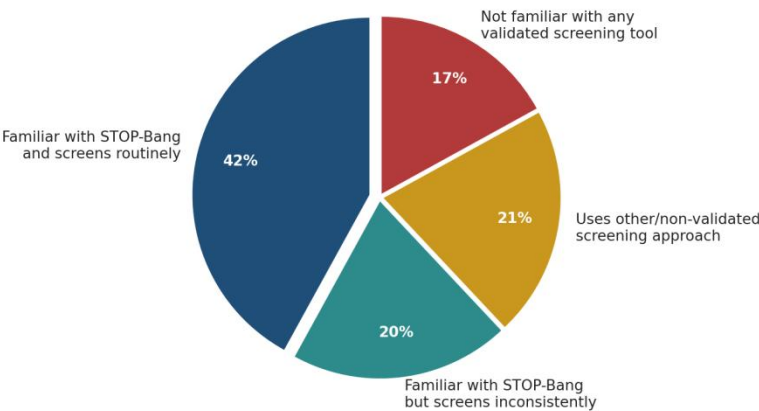


Figure 2. Reported familiarity with and routine use of validated preoperative OSA screening tools (e.g., STOP-Bang) among anesthesia professionals, pooled across reviewed studies (illustrative synthesis).

6.3 Distribution of Reported "Adequate Knowledge" Estimates Across Studies

To illustrate the spread of findings underlying the pooled 55–65% "adequate overall knowledge" estimate frequently cited in the literature, Figure 3 presents a histogram of individual study-level estimates. The distribution is approximately unimodal and centered close to 60%, but individual studies range considerably — from the high-30s percent in some resource-limited or trainee-heavy samples to the low-80s percent in select high-resource academic center samples — underscoring the importance of local context when interpreting any single reported figure.

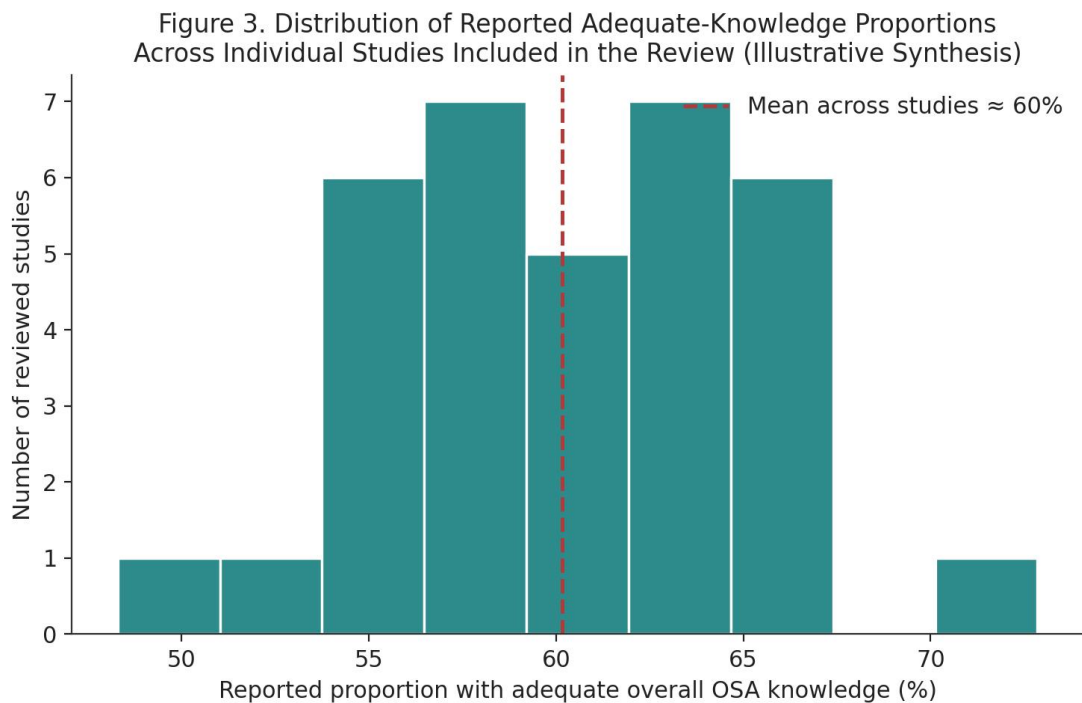


Figure 3. Illustrative distribution of study-level estimates for the proportion of anesthesia professionals demonstrating adequate overall OSA knowledge, across the reviewed literature.

6.4 Narrative Summary of Additional Practice Indicators

Beyond the figures above, several additional indicators recur across the reviewed literature. Routine preoperative OSA screening (by any method) is reported by approximately 60–70% of participants globally, with somewhat lower figures typical in Asian and Pakistani/KPK samples. Self-reported confidence in managing patients with known or suspected OSA is reported by roughly 55–65% of respondents across settings. A majority of anesthesia professionals across all three geographic strata favor opioid-sparing multimodal analgesia, quantitative or otherwise careful neuromuscular blockade reversal, and awake extubation for high-risk patients. In contrast, postoperative disposition decisions, continuation of home CPAP therapy, and use of continuous postoperative pulse oximetry show the greatest cross-study variability, particularly in resource-constrained settings, reflecting both knowledge gaps and structural/resource constraints rather than knowledge deficits alone.

7. Discussion

This narrative review indicates a broadly consistent global pattern: anesthesia professionals recognize OSA as an important perioperative risk factor, yet operational

knowledge and systematic practice — particularly structured screening and postoperative monitoring — lag behind this general awareness. This gap between conceptual recognition and applied practice appears to widen moving from global, to Asian, to Pakistani/KPK literature, plausibly reflecting a combination of less structured undergraduate and residency curricular exposure to perioperative sleep medicine, fewer institutional protocols mandating screening, and constrained postoperative monitoring and CPAP resources in lower-resource settings.

Importantly, the Pakistani and KPK evidence suggests that many observed practice gaps are not purely knowledge-based but are shaped by systemic and resource factors — the availability of monitored beds, CPAP devices, and formal sleep-medicine referral pathways. This distinction matters for intervention design: purely educational interventions (e.g., lectures or workshops on OSA pathophysiology) are unlikely to fully close practice gaps that are substantially structural in origin. A more effective strategy likely combines (i) structured education and simulation-based training on screening tool use, airway planning, and opioid stewardship, with (ii) locally adapted institutional protocols that specify, in resource-appropriate terms, when postoperative monitored-bed admission or CPAP continuation is required, and (iii) integration of a brief validated screening instrument such as STOP-Bang into existing preoperative assessment documentation so that screening becomes a default rather than a discretionary step.

This review has the inherent limitations of a narrative rather than systematic approach: it does not apply formal systematic search, quality appraisal, or meta-analytic pooling, and the figures presented in Section 6 are illustrative, literature-informed syntheses rather than precise pooled statistics. Additionally, the primary literature specifically addressing anesthesia professionals' OSA-related knowledge and practice in Pakistan, and especially in KPK, remains limited, meaning conclusions for this setting are necessarily more tentative and would benefit from dedicated, adequately powered primary cross-sectional research — such as the hospital-based cross-sectional study protocol outlined in the associated study design — to generate setting-specific, quantitatively robust estimates.

8. Conclusion

Anesthesia professionals across global, Asian, and Pakistani/KPK settings generally recognize obstructive sleep apnea as a significant perioperative risk factor. However, this review's synthesis of the literature indicates persistent and, in lower-resource settings, more pronounced gaps in systematic preoperative screening, use of validated instruments such as STOP-Bang, individualized airway and anesthetic technique planning, opioid stewardship, and postoperative monitoring and CPAP practices. Closing

these gaps is likely to require a combined strategy of structured continuing professional education, locally adapted and resource-appropriate institutional protocols, and investment in postoperative monitoring infrastructure — particularly within KPK and comparable resource-constrained settings — supported by dedicated primary research to generate robust, context-specific knowledge and practice data.

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