

INVERTING THE EVIDENCE PYRAMID: THE THREATS OF UNREGULATED META-ANALYSES AND PREDATORY PUBLISHING BY UNDERGRADUATE STUDENTS

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INTRODUCTION

THE IVORY TOWER BUILT ON SAND

Walk down the historic corridors of Khyber Medical College (KMC) on any afternoon, and you will witness a profound shift in the conversations among our MBBS students. A decade ago, undergraduate research was largely confined to cross-sectional descriptive studies or basic knowledge-attitude-practice (KAP) surveys. Today, the ambition is vastly different. Driven by fierce global competition and residency match prerequisites, students from across Khyber Pakhtunkhwa (KP) are bypassing local clinical research altogether. Instead, armed with laptops, institutional internet access, and a rudimentary, self-taught understanding of statistical software, they have set their sights on the peak of the traditional Evidence-Based Medicine (EBM) hierarchy: the systematic review and meta-analysis.

In theory, this surge of academic enthusiasm should be celebrated as a victory for undergraduate medical research in Pakistan. In practice, however, it represents an alarming, unmonitored epidemic in academic publishing. It is not the case that these young, ambitious minds are attempting high-level syntheses and scientific curiosity; rather, the existential threat to modern medical literature lies in the global scientific community's willingness to publish these unguided, structurally flawed manuscripts.

Open-access journals across the globe have lowered barriers for fundamentally untrained undergraduate student groups working without robust, qualified academic mentorship. These predatory journals are actively undermining the scientific enterprise. In doing so, they risk permanently destabilizing the foundational EBM pyramid, reducing what should be our most secure evidence into our most unreliable noise.

THE VIEW FROM PESHAWAR: A DANGEROUS INSTITUTIONAL TREND

To fully grasp the scale of this phenomenon, we must examine our own institutional landscape at Khyber Medical College. An internal review of undergraduate research submissions and independent student publications over the last three academic cycles reveals an astonishing trend. Of 142 research papers published or submitted to open-access portals by KMC students and recent MBBS graduates from KP between 2023 and 2026, an unprecedented 41% were classified as systematic reviews or meta-analyses (Table 1). On the surface, this might appear to be an academic triumph for a regional institution in Pakistan. Yet a closer look at the methodology behind these figures tells a profoundly troubling story.

Of these student-led meta-analyses, fewer than 15% listed a senior faculty member or an established, published clinical researcher as a corresponding or active contributing author. Instead, the typical authorship line consists of three to five undergraduate students, occasionally joined by a junior medical officer or house officer acting as the technical facilitator. More critically, an audit of the methodologies employed revealed that over 80% of these published papers failed to register their protocols in international databases such as PROSPERO. These lacked a validated risk-of-bias assessment (such as the Cochrane Risk of Bias tool), and relied entirely on free, open-source online software packages without the guidance of a qualified biostatistician and researcher.

The human element of this crisis is deeply concerning. These students are not mischievous actors; they are trapped in a system that rewards volume over validity.¹ In interviews with KMC undergraduates, the driving motivations become clear: 'We need PubMed-indexed publications to stand a chance at matching for foreign residencies, and our own ethical boards take six months just to approve an observational study,' a final-year student confessed. Another remarked, 'Why spend months

Table No 1: Chronological surge and specific thematic distribution of undergraduate systematic reviews and meta-analyses (SR-MAs) across Khyber Pakhtunkhwa (2021–2026). Percentages reflect the proportion of SRMAs out of total student publications for that academic year

Year	SRMA Volume (% of Total Publications)	Specific Review / Meta-Analysis Focus Areas	Primary Publishing Outlets / Open-Access Portals
2021	2 (11%)	Basic efficacy of repurposed therapies during local health crises.	Khyber Medical University Journal, Local Repository Streams
2022	4 (16%)	Efficacy of global online e-learning modalities vs traditional medical rounds.	BMC Medical Education, Global Student Open Portals
2023	9 (29%)	Prevalence patterns of mental health stressors among South Asian medical students.	Cureus Open Access, Pakistan Medical Students Research Journal
2024	16 (41%)	Global surgical technique comparative outcomes; diagnostic accuracy of basic radiology AI.	Cureus, PLOS ONE, RMI Journal of Medical Students
2025	22 (45%)	Therapeutic interventions in cardiovascular medicine; large-scale epidemiological trends.	Cureus International, MDPI Healthcare, Frontiers Journals
2026*	26 (45%)	Artificial intelligence diagnostic models in low-resource settings; digital health interventions.	Cureus Network, Regional Student-led Publication Directories

tracking down non-compliant patients in the overstretched wards of Khyber Teaching Hospital when we can download twenty data sheets from our hostel rooms and write a meta-analysis in a week?’

THE EDITORIAL CRISIS: SYSTEMIC FAILURE OF GLOBAL PEER REVIEW OR SOMETHING ELSE

The structural cracks in undergraduate research are entirely predictable, but the global peer-review system’s compliance is not. Systematic reviews and meta-analyses were traditionally regarded as the definitive authorities of clinical truth because they require an extraordinary level of expertise. Conducting a valid meta-analysis demands not only absolute mastery of complex statistical modeling (such as random-effects models, heterogeneity assessments, and publication bias metrics) but also deep, years-long clinical familiarity with the subject matter to identify subtle confounders and clinical heterogeneity across primary trials.²

When an undergraduate group attempts this without experienced supervision, the resulting manuscript is inevitably plagued by fatal flaws: inappropriate pooling of clinical trials, misinterpretation of secondary outcomes, and a failure to recognize systematic bias in the primary literature.³ Yet these papers are being accepted and published at an unprecedented rate. Driven by commercial open-access publishing models that thrive on high article processing charges (APCs) and rapid turnover, many international journals have effectively compromised their peer-review mechanisms. Editorial boards frequently assign these highly specialized manuscripts to generalist reviewers who lack the statistical or clinical acumen to spot structural defects. Consequently, a deeply flawed, student-authored meta-analysis is granted the same digital object identifier (DOI) and indexation status as a rigorous, “years-in-the-making” review from an elite academic

group.

INVERTING THE EBM PYRAMID

The immediate casualty of this editorial negligence is the integrity of Evidence-Based Medicine. The EBM pyramid has a specific architecture: individual case reports and expert opinions form the broad base; observational studies occupy the middle; randomized controlled trials (RCTs) constitute the upper tier; and systematic reviews sit at the apex as the gold standard for clinical guidance.⁴ This hierarchy assumes that the quality of synthesis at the top filters and refines the evidence below.

When the scientific record is flooded with hundreds of unguided, poorly synthesized undergraduate meta-analyses, this pyramid is violently inverted. Methodological flaws at the apex contaminate the entire structure. Because systematic reviews are heavily weighted by algorithmic search tools, clinical aggregators, and artificial intelligence diagnostic models, these flawed student papers are already beginning to pollute global clinical recommendations. A weak, improperly pooled meta-analysis can erroneously conclude that a therapeutic intervention is safe or effective, directly contradicting the very RCTs it purports to synthesize. When the strongest tier of evidence is structurally weaker than the raw data it rests upon, the foundation of modern medical decision-making begins to collapse.⁵

A PATH FORWARD: INSTITUTIONAL AND EDITORIAL GUARDIANSHIP

Arresting this slide toward scientific degradation requires immediate, decisive intervention from both local institutions, such as Khyber Medical College, and editorial bodies, such as the Journal of Medical Sciences. We must move from an era of permissive student publishing to one of strict, protective academic guardianship. First, institu-

tional policy must require that no undergraduate medical student may submit a systematic review or meta-analysis to any journal without a verified, named faculty mentor with a documented publication record in that field. KMC and similar regional institutions must establish dedicated Undergraduate Research Committees to review the methodological soundness of student protocols before they are registered internationally. Moreover, the Ethical review committees and boards must act now and make the ethical approval certificate a mandatory component before initiating a systematic review or a meta-analysis.

Second, medical journals, particularly those with in developing healthcare ecosystems, must enforce strict gatekeeping. At JMS, we are introducing rigorous mandatory checklists for all systematic review submissions, requiring explicit proof of pre-registration (e.g., PROSPERO), detailed data-sharing files, and a formal sign-off from an independent biostatistician. Furthermore, we must actively educate our students that a beautifully executed, honest, and localized cross-sectional study addressing a unique healthcare challenge in KP is infinitely more valuable to the global medical community than a flawed, unguided meta-analysis on a global disease that they have never personally treated in a clinical setting.⁶

The ambition of our undergraduate medical students is one of Khyber Pakhtunkhwa's greatest untapped scientific resources. By restoring rigor, demanding absolute mentorship, and holding the global peer-review process to its sacred obligations, we can ensure that our students contribute to the elevation of medical science—rather than the erosion of its most vital foundations.

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