Review Article

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Medical Education in the Gulf Cooperation Council: A Saudi Arabia Anchored Analysis from Expansion to System Alignment

MOHAMMAD MUZAFFAR MIR[1]*, PhD; AHMAD HAMOUD AL-HAZMI[2], PhD; ALSALEEM MOHAMMED ABADI[3], MD; ABDULLAH M. AL-SHAHRANI[4], ABFM; MUSHABAB ALGHAMDI[5], MD; MOHANNAD MOHAMMAD S. ALAMRI[4], MD; AHMED YAHIA AL AMEER[6], MSc; SABA MUZAFFAR MIR[7], MD; MOHAMMED JEELANI[8], MD; JUNAID AHMAD[7], MD; MOHAMMED OHAJ[1], PhD

[1]Department of Clinical Biochemistry, College of Medicine, University of Bisha, Bisha, 61922, Saudi Arabia; [2]Department of Family and Community Medicine, College of Medicine, Jouf University, Sakaka, 72388, Saudi Arabia; [3]Department of Family and Community Medicine, College of Medicine, King Khalid University, Abha 61421, Saudi Arabia; [4]Department of Family and Community Medicine, College of Medicine, University of Bisha, Bisha, 61922, Saudi Arabia; [5]Department of Internal Medicine, College of Medicine, University of Bisha, Bisha, 61922, Saudi Arabia; [6]Department of Surgery, College of Medicine, University of Bisha, Bisha, 61922, Saudi Arabia; [7]Department of Microbiology, Government Medical College, Baramulla, 193101, J and K, India; [8]Department of Physiology, Ayaan Institute of Medical Sciences, Telangana, 501504, India

Abstract

Introduction: Medical education in the Gulf Cooperation Council (GCC) has undergone substantial transformation over the past two decades, driven by health system reform, workforce localization, and increasing demand for quality and accountability. Saudi Arabia serves as a central analytical anchor due to its scale and regulatory maturity. This study provides a structured, policy-oriented synthesis of medical education across the GCC and examines its transition from expansion toward system alignment.

Methods: A narrative review with structured thematic analysis was conducted. A search of PubMed, Scopus, and Web of Science, supplemented by policy documents and institutional reports, was performed for 2010–2025. Sources were selected based on relevance to GCC medical education. Data were organized across domains, including governance and accreditation, undergraduate education, assessment and licensing, postgraduate training and workforce alignment, and faculty development.

Results: Substantial progress is evident in regulatory consolidation, competency-based education, simulation-based learning, and national licensure examinations. However, implementation remains variable across institutions and countries. Key challenges include faculty capacity constraints, limited clinical training infrastructure, an imbalance in assessment practices, and misalignment between educational output and workforce needs. The literature remains largely descriptive, with limited standardized data on the outcomes and workforce impact.

Conclusion: Medical education in the GCC is transitioning from expansion toward system alignment, where integration of educational design, regulation, and workforce planning is critical. Strengthening assessment systems, investing in faculty development, expanding community-based training, and improving outcome measurements are essential. A coordinated, data-driven approach with regional collaboration is required to advance a responsive and globally competitive medical education system.

Keywords: Medical education; Competency-based education; Workforce

**Corresponding author:*
Mohammad Muzaffar Mir, PhD;
Department of Clinical Biochemistry,
College of Medicine,
University of Bisha,
Bisha, 61922, Saudi Arabia
Tel: +96-6-501427212
Email: mirmuzaffar11@gmail.com

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Introduction

Medical education is a foundational determinant of healthcare quality, patient safety, workforce sustainability, and health system innovation. The competence, professionalism, adaptability, and ethical grounding of physicians are shaped fundamentally by the quality of undergraduate and postgraduate medical education systems. Inadequately trained physicians not only compromise individual patient outcomes but also undermine public trust, system efficiency, and long-term health performance (1, 2). Consequently, reform of medical education has emerged as a central priority in health policy discourse globally (3, 4).

Over the past two decades (approximately 2000-2024), medical education in the GCC has undergone a major evolution, driven by health system reform, workforce localization, and increasing demand for quality and accountability (5-7). More recent reforms, particularly in the post-pandemic period (2020–2024), have accelerated the adoption of digital learning, simulation-based training, and system-level alignment strategies. This transformation reflects the growing recognition that contemporary healthcare systems require physicians capable of functioning effectively within complex clinical environments, rapidly evolving technologies, multidisciplinary teams, and diverse patient populations (8-10).

These global developments are particularly relevant to the Gulf Cooperation Council (GCC) region: Saudi Arabia, the United Arab Emirates, Qatar, Kuwait, Oman, and Bahrain, which are experiencing profound demographic, epidemiological, and health system transitions (11). Rapid population growth, urbanization, increased life expectancy, and a rising burden of non-communicable diseases such as diabetes, cardiovascular disease, and cancer have placed unprecedented demands on healthcare delivery systems across the region (11, 12). In response, GCC governments have prioritized health sector reform and human capital development as strategic national objectives, with medical education positioned as a critical pipeline for developing a competent, locally trained, and future-ready physician workforce (13-15).

Since the early 2000s, the GCC region has witnessed rapid expansion in medical schools, student intake, postgraduate training programs, and regulatory oversight mechanisms. Saudi Arabia, in particular, has experienced large-scale growth in undergraduate and postgraduate medical education, alongside the strengthening of accreditation systems and implementation of national licensure examinations (16-18). Similar, though smaller-scale, developments have occurred across other GCC countries. While this expansion has improved access to medical education and increased the number of locally trained physicians, it has also introduced important challenges related to variability in educational quality, adequacy of clinical training capacity, faculty preparedness, and consistency of assessment practices (19, 20).

Despite a growing body of literature on medical education in the GCC, existing studies remain fragmented in scope and focus. Many prior publications have concentrated on individual countries, isolated curricular reforms, or descriptive accounts of institutional development, often without integrating governance structures, accreditation systems, assessment models, workforce alignment, and faculty capacity into a unified analytical framework. Furthermore, limited attention has been given to the interaction between rapid educational expansion and system-level challenges such as workforce mismatch, exam-centric learning cultures, and uneven implementation of competency-based approaches. Importantly, much of the earlier literature predates recent reforms accelerated by digital transformation, post-pandemic restructuring of education, and intensified national workforce localization strategies (16, 17, 20).

Against this backdrop, there is a clear need for an integrated, policy-oriented analysis that moves beyond descriptive reporting to examine how different components of medical education systems interact across the GCC region. In this review, Saudi Arabia is analytically foregrounded due to its scale, centralized regulatory architecture, national licensure systems, and expanding academic and policy output, while maintaining a comparative regional perspective that incorporates experiences from other GCC countries.

The objective of this study is to provide a structured synthesis and critical interpretation of medical education in the GCC across key domains, including governance and accreditation, undergraduate education, assessment and licensing, postgraduate training and workforce alignment, faculty development, and future system-level priorities. The central thesis of this article is that while GCC medical education has progressed significantly from rapid expansion toward regulatory consolidation and curricular modernization, its next phase will depend on achieving deeper alignment between educational quality, assessment practices, faculty capacity, and national health workforce needs.

Unlike the previous descriptive studies, this review integrates governance, medical education, assessment strategies and workforce alignment into a unified policy framework. The conceptual evolution of medical education in the GCC, along with key system-level dynamics, is illustrated in Figure 1.

Methods

Study design

This study was conducted as a narrative review with a structured, policy-oriented thematic analysis. A narrative approach was selected because medical education systems across the Gulf Cooperation Council (GCC) countries are heterogeneous in structure, regulation, reporting practices, and available evidence. In addition to peer-reviewed literature, relevant information is distributed through policy documents, accreditation reports, institutional publications, and governmental strategies, which are not uniformly amenable to systematic review methodologies.

Narrative synthesis, therefore, allows integration of diverse evidence types while enabling contextual interpretation of system-level reforms, policy directions, and implementation challenges. This approach is consistent with established guidance on narrative reviews in health sciences literature (21, 22).

Search strategy and information sources

A structured literature search was conducted to identify relevant publications addressing medical education in GCC countries. Electronic databases searched included PubMed, Scopus, and Web of Science. In addition, manual search was performed to identify official documents from ministries of health and education, publications from accreditation and regulatory bodies, reports from international organizations such as the World Health Organization (WHO) and World Federation for Medical Education (WFME), and policy documents related to national health strategies and workforce development.

The research focused primarily on literature published between Jan 1, 2000 and Dec 31, 2025, reflecting the period of most structural transition in GCC medical education systems. Earlier studies were selectively included when they provided essential historical or conceptual context. This multi-source approach ensured broad coverage of both peer-reviewed and policy-relevant evidence across the GCC context.

Search terms

Search terms were developed to capture core domains of medical education and policy. Keywords were combined using Boolean operators and adapted across databases. The search combinations included:

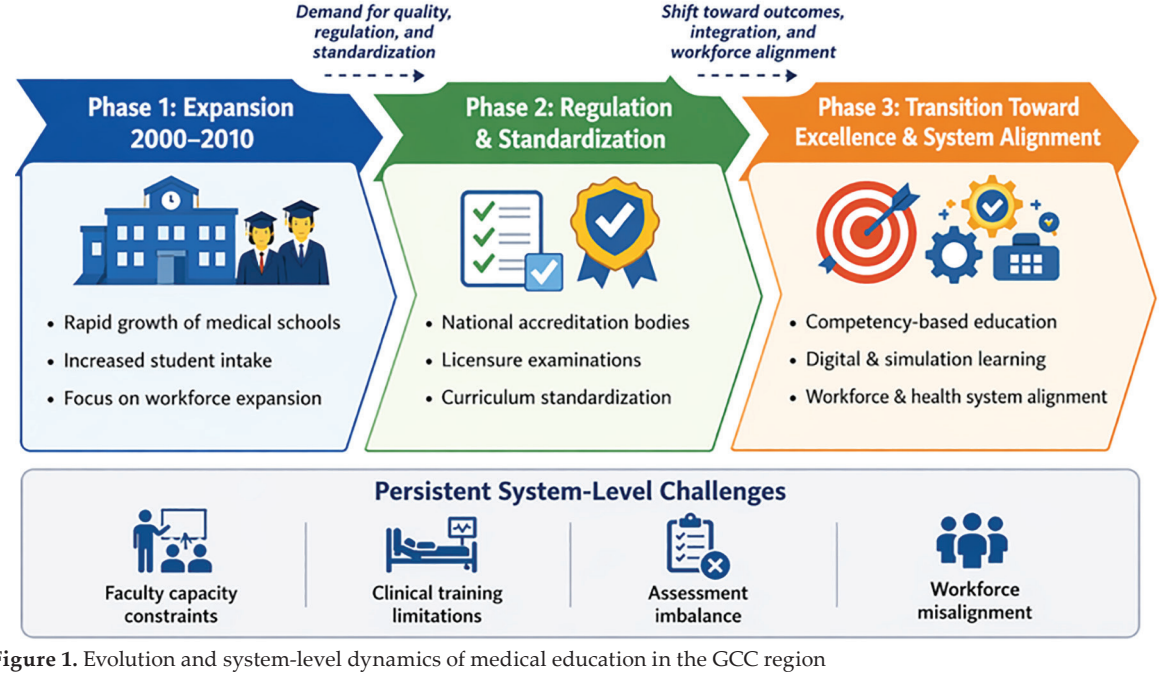

Figure 1. Evolution and system-level dynamics of medical education in the GCC region
This figure illustrates the progression of medical education systems in the GCC from an initial phase of rapid expansion in institutional capacity and student intake, through subsequent regulatory consolidation and standardization, toward a current transitional phase focused on system alignment. This transition emphasizes integration of competency-based education, assessment systems, faculty capacity, and workforce planning. The framework also highlights persistent cross-cutting challenges, including variability in implementation, limitations in clinical training capacity, faculty constraints, assessment imbalance, and misalignment between educational output and healthcare workforce needs. These interacting elements collectively shape the ongoing evolution of medical education across the region. GCC: Gulf Cooperation Council.

• "Medical education" AND "GCC"
• "Medical education" AND "Saudi Arabia"
• "Undergraduate medical education" AND ("UAE" OR "Qatar" OR "Kuwait" OR "Oman" OR "Bahrain")
• "Postgraduate medical education" AND "GCC"
• "Medical licensure" OR "licensing examination" AND "GCC"
• "Accreditation" AND "medical schools" AND "GCC"
• "Faculty development" AND "medical education" AND "GCC"
• "Health workforce" AND "medical training" AND "GCC"

Where appropriate, synonyms and related terms such as "competency-based education," "assessment," and "health professions education" were incorporated.

Study selection and source prioritization

The titles and abstracts of the identified records were screened for relevance to predefined thematic domains. Full-text articles were subsequently assessed for eligibility based on conceptual relevance, methodological clarity, and contribution to system-level understanding of medical education in the GCC. Consistent with the narrative review design, source selection was iterative and interpretive rather than strictly procedural. Priority was given to recent publications, policy-relevant reports, multicountry analyses, and studies with direct implications for governance, assessment, faculty development, and workforce alignment.

Where multiple sources addressed similar domains, preference was given to those offering broader regional applicability or stronger methodological grounding. This approach ensured both contextual depth and analytical coherence while maintaining transparency, as illustrated in Figure 2.

Eligibility criteria

Sources were included if they:
• addressed undergraduate or postgraduate medical education in one or more GCC countries.

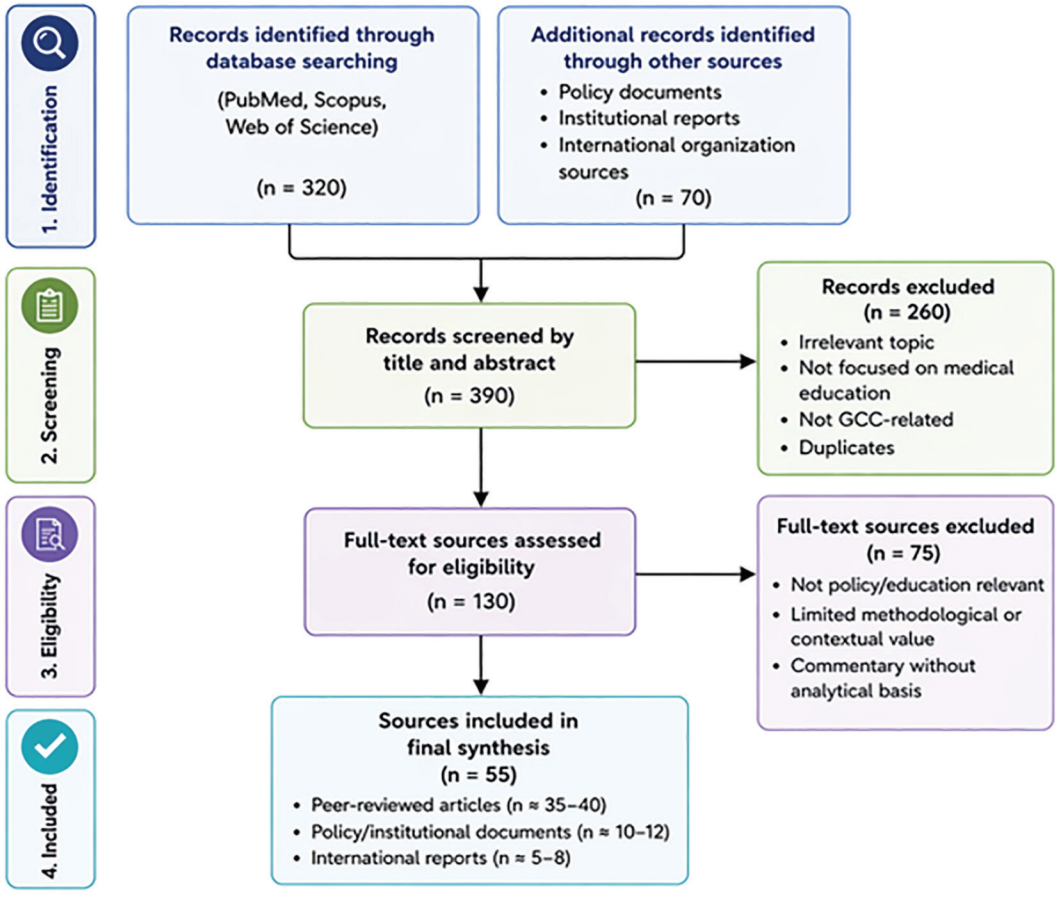

Figure 2. Source identification and selection process for the narrative review
This flow diagram illustrates the process of source identification, screening, eligibility assessment, and inclusion in this narrative review. Literature search was conducted using PubMed, Scopus, and Web of Science, supplemented by manual searches of policy documents, institutional reports, and international organization sources. Sources were screened for relevance to medical education in the GCC, followed by full-text evaluation and thematic analysis. Given the narrative review design and inclusion of diverse evidence types, the flow diagram represents a structured but non-PRISMA approach to enhance transparency. Not all sources included in the synthesis are individually cited, as some policy and institutional documents were used to support contextual interpretation.

• examined governance, accreditation, assessment, licensing, faculty development, curriculum reform, or workforce alignment.
• represented peer-reviewed research, official institutional publications, or policy-relevant reports.
• provided empirical, descriptive, or conceptual insight into medical education systems or reforms.

Sources were excluded if they:
• focused exclusively on non-medical health professions without relevance to physician training.
• addressed healthcare delivery without clear linkage to medical education or training.
• were opinion-based without identifiable analytical or institutional grounding.
• lacked accessible full text or verifiable provenance.

Only English-language sources were systematically included. Arabic-language materials were considered when official translations or reliable institutional summaries were available. This restriction is acknowledged as a limitation.

Analytical framework

We employed an *a priori* structured thematic framework to guide the data extraction and synthesis processes Sources were organized into the following domains:
• Governance, regulation, and accreditation
• Undergraduate medical education
• Assessment and licensing
• Postgraduate medical education and workforce alignment
• Faculty development and academic capacity
• Cross-cutting challenges and future system priorities

Within each domain, the findings were synthesized to identify common reform trends, system-level strengths, recurrent challenges, the patterns of implementation variability, and policy-relevant implications.

The policy-analysis component was operationalized using the examination of interactions between educational structures, regulatory systems, and workforce needs, rather than through the application of a single formal policy-analysis model. This approach allows context-sensitive interpretation while avoiding overextension of methodological claims.

Regional emphasis and comparative approach

Saudi Arabia was analytically foregrounded due to its larger population, extensive network of medical institutions, centralized regulatory structures, national licensure examination system, and comparatively greater volume of academic and policy literature.

Notably, the analysis incorporates evidence from other GCC countries, including the United Arab Emirates, Qatar, Kuwait, Oman, and Bahrain, to identify shared regional patterns, contextual differences, and areas of convergence and divergence. Saudi Arabia is, therefore, used as an analytical anchor rather than as a proxy for the entire region.

Quality considerations

Given the diversity of the evidence types included, a uniform formal quality appraisal tool was not applied. Instead, source credibility was assessed based on peer-review status, institutional authority, recency, relevance, and consistency with other available evidence.

This pragmatic approach is consistent with narrative review methodology although it is acknowledged as a limitation compared to systematic review standards.

Reporting and transparency

To enhance transparency, we incorporated a simplified flow diagram (Figure 2) to illustrate the process of source identification, screening, and inclusion. While not a formal PRISMA-based systematic review, this representation clarifies the overall review process.

Results

Governance, regulation, and accreditation

The reviewed literature indicates that governance and regulatory oversight of medical education in the GCC have become progressively more centralized over the past two decades. Across the region, national bodies now play a central role in accreditation, curriculum oversight, institutional authorization, and professional regulation (13, 14, 16, 19). This transition reflects a shift from institution-driven models toward structured national systems of quality assurance.

Several studies and policy reports describe increasing alignment of accreditation frameworks with international standards, particularly those of the World Federation for Medical Education (WFME) (13, 15, 18, 19). In Saudi Arabia, accreditation and regulatory processes have been described in greater detail, with defined expectations for curriculum structure, faculty qualifications, assessment systems, and institutional governance (16, 20, 23). Similar regulatory developments have been reported in the United Arab Emirates and Oman, where national accreditation and postgraduate training

authorities play an increasingly visible role in standard-setting and institutional oversight (17, 18). An overview of key structural features of medical education systems across GCC countries is presented in Table 1.

The available literature suggests that these regulatory reforms have improved institutional accountability and standardization of educational processes. However, reporting depth varies across countries, with Saudi Arabia contributing a larger proportion of peer-reviewed and policy-based documentation, while evidence from other GCC countries is more frequently derived from institutional reports and regional analyses (13, 15, 20).

Undergraduate medical education

The reviewed sources demonstrate substantial curricular reform in undergraduate medical education across the GCC, with a shift from traditional discipline-based models toward integrated and system-based curricula (16, 19, 26). Studies from Saudi Arabia and the broader GCC describe increased incorporation of early clinical exposure, student-centered learning, and competency-oriented educational approaches (16, 17, 19).

Professionalism, ethics, patient safety, and evidence-based practice are increasingly embedded as core components of undergraduate training. For example, studies from Saudi medical schools report structured integration of professionalism and patient safety within longitudinal curricula and case-based teaching formats (16, 20, 26). Early clinical exposure has also become more common, with reports describing student engagement in clinical environments during preclinical years to support contextual learning and professional identity development (17, 18, 25).

Simulation-based education is consistently highlighted across the literature (27). Multiple studies report the expansion of clinical skills laboratories and high-fidelity simulation centers, particularly in Saudi Arabia and the UAE, supporting training in procedural skills, communication, and team-based clinical scenarios (28-30). For instance, Binsuwaidan, et al. (2025) describe positive learner and faculty perceptions of simulation-based learning in health professions education within the region (28).

Table 1. Overview of Medical Education Systems and Regulatory Structures in GCC Countries

Country	Approximate No. of Medical Schools*	Regulatory / Accreditation Authority	National Licensure / Qualifying Examination	Predominant Curriculum Model	Key System Characteristics	Key References
Saudi Arabia	>40	NCAAA; Saudi Commission for Health Specialties (SCFHS)	SMLE	Integrated; CBME-aligned	Centralized governance; large-scale undergraduate and postgraduate capacity; structured licensure system	(13, 15, 16, 20)
United Arab Emirates	~10	Commission for Academic Accreditation (CAA), MOE	EMREE	Integrated / hybrid	Strong private sector participation; diverse institutional models; evolving regulatory standardization	(17, 18, 24)
Qatar	2–3	Qatar Council for Healthcare Practitioners (QCHP); institutional accreditation bodies	QCHP Licensure Exam	North American aligned	Limited number of institutions; strong international partnerships; high resource investment	(17, 24)
Kuwait	1–2	Kuwait University; Ministry of Health	KMLE	Traditional with integration elements	Public-sector dominated system; limited institutional diversity	(17, 18, 24)
Oman	2	Oman Authority for Academic Accreditation (OAAA); Oman Medical Specialty Board (OMSB)	OMSB Exam	Integrated	Strong postgraduate oversight; centralized residency system	(18, 24, 25)
Bahrain	2	Bahrain Quality Authority (BQA); National Health Regulatory Authority (NHRA)	NHRA Exam	Integrated	Regional training collaborations; relatively small but structured system	(14, 24, 25)

Despite these advances, variability in implementation remains evident. Some studies note that expansion of student intake has, in certain institutions, outpaced the availability of clinical training opportunities and supervision capacity (16, 31). Similarly, exposure to primary care and community-based settings is reported to be limited in some programs, with emphasis remaining predominantly on tertiary care environments (20, 31). Research integration within undergraduate curricula is also uneven, with some institutions offering structured research pathways, while others provide more limited opportunities for student engagement in scholarly activity (20, 30).

Assessment and licensing

The reviewed literature indicates increasing standardization of assessment systems across the GCC, particularly through the introduction and consolidation of national licensure examinations (31–35). In Saudi Arabia, the Saudi Medical Licensure Examination (SMLE) is widely described as a key regulatory instrument that influences undergraduate curricula, graduate preparedness, and postgraduate selection processes (32, 34).

Comparable licensing or qualifying examinations are reported in other GCC countries, including the United Arab Emirates, Qatar, Oman, and Bahrain; however, their structure and implementation vary (18, 30, 31). These examinations serve as mechanisms for ensuring minimum competency standards and promoting consistency across institutions.

In addition to national examinations, the literature describes the use of structured institutional assessment methods, including objective structured clinical examinations (OSCEs), written assessments, and, to a lesser extent, workplace-based evaluation tools (17–19). However, detailed multicountry evidence on the systematic implementation of programmatic assessment remains limited. Most available studies emphasize summative assessment systems rather than longitudinal, competency-based evaluation approaches (18, 19, 35).

Some reports also highlight the growing need for faculty development in assessment practices, including examiner training and feedback delivery, to support more comprehensive evaluation of learner performance (17, 19). Overall, assessment systems in the GCC appear to be evolving toward greater standardization although evidence on the balance between summative and formative approaches remains limited.

Postgraduate medical education and workforce alignment

There has been significant growth in postgraduate medical education throughout the GCC region, especially in Saudi Arabia, where national matching, residency training, and accreditation are managed by centralized systems (18, 33, 34, 36). This growth is directly related to national initiatives to localize the workforce and lessen reliance on foreign healthcare workers (14, 24, 36-38).

Studies and reports indicate that Saudi Arabia has developed one of the most extensive postgraduate training systems in the region, with increasing numbers of residency and fellowship programs across a wide range of specialties (17, 18). Evidence from other GCC countries, including Qatar and Oman, also suggests continued development of local postgraduate training capacity although the scale and published documentation are comparatively smaller (17, 18). Workforce-related concerns are consistently highlighted in the literature. Several studies report imbalances in specialty distribution, with relative shortages in primary care, family medicine, psychiatry, and geriatrics compared with hospital-based subspecialties (17, 24, 25, 31). These findings are frequently linked to broader structural and policy factors influencing career preferences and training availability.

Variability in supervision quality, clinical exposure, and mentorship is also described, particularly in settings where expansion of training positions has occurred rapidly (31, 33). In addition, the integration of research and scholarly activity within postgraduate training is reported to be inconsistent, with some programs offering structured research opportunities, while others provide limited protected time and support (17, 19, 20).

Faculty development and academic capacity

Faculty development is consistently identified as a critical determinant of educational quality across the GCC (19, 20, 31, 39, 40). The reviewed literature highlights faculty availability, teaching expertise, and institutional support as the key factors influencing the effectiveness of curricular and assessment reforms (39-41).

Multiple studies describe the expansion of faculty development initiatives, including workshops on teaching methods, assessment strategies, and simulation-based education (19, 20, 41, 42). However, these initiatives are often short-term and variable in structure. Longitudinal faculty development programs, formal qualifications in medical education, and structured mentorship systems are less consistently reported across institutions (19, 20, 25).

Several sources also note the continued reliance on expatriate faculty in parts of the region, particularly in earlier stages of institutional development (19, 20, 25). At the same time, there is increasing emphasis on developing locally trained clinician-educators and strengthening academic leadership capacity, especially in Saudi Arabia (20, 31, 32).

Recognition of educational scholarship within academic promotion systems is variably described. Some reports emphasize the need to integrate teaching excellence and educational research into academic career pathways; however, consistent institutional implementation remains limited (20, 31, 32). Overall, the evidence suggests that while faculty development is widely acknowledged as important, its scale, sustainability, and institutional integration remain uneven across the region (38-40).

Integrative patterns derived from the examined literature

Across all domains, several recurring patterns are evident. First, medical education reform in the GCC is closely linked to broader health system transformation, workforce localization, and quality assurance initiatives (13-16, 24). Second, there is a consistent regional trend toward curricular integration, strengthened regulatory frameworks, simulation-based learning, and standardized assessment systems (16-19, 29, 30).

A notable feature of the literature is the predominance of descriptive and policy-oriented reporting. While numerous studies document institutional reforms and educational strategies, there is comparatively limited availability of standardized data on educational outcomes, graduate competence, or long-term workforce impact (18-20, 24, 31). For example, few studies provide quantitative measures of clinical competence, longitudinal assessment outcomes, or post-graduation workforce distribution across GCC countries.

Another recurring observation is the uneven representation of countries within the literature. Saudi Arabia accounts for a substantial proportion of published evidence, while other GCC countries are less frequently represented in peer-reviewed studies, relying more on institutional reports and regional summaries (17, 18, 25).

The analyzed literature indicates that GCC medical education has progressed beyond a phase characterized mostly by institutional expansion. Current data indicates a complex environment marked by regulatory consolidation, curricular reform, heightened focus on competency-based education, and increased attention to alignment with national health priorities (13-15, 19). Table 2 summarizes significant domain-level advancements and related issues throughout GCC medical education systems.

Discussion

This review demonstrates that medical education across the Gulf Cooperation Council (GCC) has undergone educational restructuring over the past two decades, progressing from rapid institutional expansion toward greater regulatory

Table 2. Key Domains, Observed Developments, and Reported Challenges in GCC Medical Education

Domain	Observed Developments (Findings from Literature)	Reported Challenges (Evidence-Based Observations)	Key References
Governance & Accreditation	Establishment of national accreditation bodies; increasing alignment with international standards (e.g., WFME); centralized regulatory oversight in several countries	Variability in implementation of standards; limited outcome-based evaluation; variable integration with workforce planning systems	(13, 16, 17, 19, 24)
Undergraduate Education	Adoption of integrated curricula; early clinical exposure; increased use of simulation-based learning; inclusion of professionalism and patient safety	Variability in clinical training capacity; limited exposure to primary care in some institutions; uneven research integration	(16, 17, 20, 30)
Assessment & Licensing	Introduction and consolidation of national licensure examinations (e.g., SMLE); increased use of structured assessments (OSCEs, written exams)	Emphasis on high-stakes summative assessment; limited implementation of programmatic and workplace-based assessment	(18, 19, 33-35)
Postgraduate Training	Expansion of residency programs; development of centralized training and matching systems; increasing focus on workforce localization	Imbalance in specialty distribution; variability in supervision and mentorship; inconsistent research integration	(17, 19, 35, 37)
Faculty Development	Expansion of faculty training initiatives; increased awareness of educational roles; use of simulation and teaching workshops	Faculty shortages; limited protected teaching time; lack of structured career pathways for clinician-educators	(16, 39, 40)
Educational Outcomes & Data Systems	Growing recognition of need for quality monitoring and evaluation	Limited standardized data on graduate competence, workforce outcomes, and long-term impact of reforms	(18, 20, 31)

consolidation, curricular modernization, and increasing alignment with international educational standards. The reviewed literature consistently highlights advances in accreditation systems, adoption of competency-based frameworks, expansion of simulation-based education, and implementation of national licensure examinations (16-19).

At the same time, the findings suggest that structural and regulatory development has not been uniformly matched by implementation depth, outcome measurement, or system-level alignment. Across domains, recurrent patterns include variability in educational delivery, uneven faculty capacity, inconsistent integration of workplace-based assessment, and ongoing concerns regarding alignment between medical education output and workforce needs (17, 20). These observations indicate that GCC medical education is currently in a transitional phase, where formal systems have matured, but their translation into consistently high-quality educational practice remains incomplete.

Why do challenges persist?

The persistence of these challenges, despite visible progress, reflects several interrelated structural and systemic factors. First, expansion of educational capacity has, in many settings, outpaced the development of faculty resources, clinical training environments, and protected teaching time. While increasing student intake and postgraduate training positions have strengthened workforce pipelines, the literature suggests that supervision, mentorship, and feedback systems have not expanded proportionately (16, 17, 20). This imbalance affects both the quality and consistency of competency development.

Second, strengthening of regulatory and accreditation frameworks has improved accountability but may also have contributed to compliance-oriented educational cultures. The increasing prominence of high-stakes licensure examinations, while essential for standardization, appears to influence learning behavior toward examination performance when not balanced by longitudinal and workplace-based assessment approaches (18, 19, 32, 33).

Third, although workforce localization has elevated the strategic importance of medical education, coordination between educational planning and workforce modeling remains variable. Several sources point to ongoing mismatches between specialty distribution and population health needs, particularly in primary care and community-based disciplines (19, 31, 40-43). This suggests that educational reform and workforce policy, while conceptually aligned, are not always operationally integrated.

Finally, variability in institutional capacity across the region contributes to uneven implementation of reforms. Differences in faculty expertise, infrastructure, educational leadership, and access to training resources influence how curricular and assessment innovations are adopted and sustained (16, 17, 19, 20). This heterogeneity remains a defining characteristic of the GCC medical education landscape.

Comparison with global trends

The patterns identified in this review are consistent with broader global experiences in medical education reform. Many health systems transitioning toward competency-based education have reported similar challenges, including difficulties in implementing programmatic assessment, ensuring faculty readiness, and aligning educational outcomes with workforce needs (5-8).

The expansion of simulation-based education, early clinical exposure, and digital learning platforms across the GCC reflects global trends accelerated by technological advancement and the COVID-19 pandemic (19, 27–29, 37, 41, 42). Likewise, increasing emphasis on professionalism, patient safety, and interprofessional collaboration aligns with internationally recognized competency frameworks.

However, the GCC context also presents distinct characteristics. A particularly notable feature is the strong linkage between medical education reform and national workforce localization strategies. Unlike many established healthcare systems, GCC countries are actively transitioning from reliance on expatriate healthcare professionals toward nationally trained workforces (43). This dual demand for both quality enhancement and workforce expansion introduces additional complexity into medical education reform.

Policy and system level implications

The findings of this review also suggest that the next phase of medical education reform in the GCC should focus on deeper system integration and outcome-oriented implementation. Strengthening faculty capacity is central to this transition. The literature consistently identifies faculty availability, educator preparation, and protected teaching time as critical determinants of educational quality (16, 20, 39, 40). Developing structured clinician-educator pathways, embedding faculty development within institutional frameworks, and recognizing educational scholarships are essential for

Table 3. Priority Actions for Strengthening Medical Education Systems in the GCC

Priority	Action	Timeframe	Stakeholders
High	Strengthen faculty development and protected teaching time	Short–Medium (1–3 yrs)	Universities; Regulators
High	Integrate programmatic assessment with licensure systems	Medium (2–5 yrs)	Medical councils; Institutions
High	Expand primary care and community-based training	Medium–Long (3–7 yrs)	Health ministries; Training bodies
Medium	Develop systems for tracking graduate and workforce outcomes	Medium (2–5 yrs)	Health authorities; Academia
Medium	Strengthen research integration in training programs	Medium (2–5 yrs)	Universities; Research bodies
Medium	Promote GCC-level collaboration and standard harmonization	Long (5–10 yrs)	Regional councils
Emerging	Integrate digital learning and AI with evaluation frameworks	Short–Medium (1–4 yrs)	Institutions; Regulators

sustaining reform efforts (40, 44, 45). To enhance the practical applicability of these findings, key system-level priorities are summarized in Table 3, outlining actionable strategies, timelines, and responsible stakeholders for advancing medical education across the GCC.

Assessment reform also represents a key priority. Integrating national licensure systems with programmatic assessment approaches, incorporating workplace-based evaluation, longitudinal feedback, and competency tracking, can provide a more comprehensive understanding of learner development while maintaining accountability (18, 19, 32, 33).

Improving alignment between medical education and workforce needs requires closer coordination between educational institutions, regulatory bodies, and health system planners. Expanding training opportunities in primary care, community-based settings, and underserved specialties is essential to address regional health priorities. In addition, strengthening data systems and outcome measurement is critical. The current literature is largely descriptive, with limited standardized evidence on graduate competence, educational effectiveness, or workforce impact. Developing robust monitoring frameworks would support evidence-informed policy decisions and enhance accountability across systems. An integrated framework linking educational structures, regulatory systems, and workforce alignment in the GCC is presented in Figure 3.

Future directions and research priorities

The next phase of medical education development in the GCC will depend on the ability to translate structural reforms into measurable improvements in educational quality, workforce alignment, and health system impact. A central priority is the effective operationalization of CBME. While CBME frameworks are widely adopted at the policy level, their consistent implementation requires strengthening of programmatic assessment systems, including workplace-based evaluation, longitudinal feedback, and competency tracking. Future research should focus on how CBME is implemented in practice across different institutional contexts, with particular attention to feasibility, assessment validity, and faculty engagement.

Faculty development remains a critical enabler of sustained reform. Transitioning from short-term training activities to longitudinal, structured faculty development pathways including clinician-educator tracks, mentorship systems, and recognition of educational scholarship will be essential. Further research is needed to evaluate the impact of these initiatives on teaching quality and learner outcomes.

Alignment between medical education and workforce needs represents another major area for development. Expanding training in primary care, community-based disciplines, and underserved specialties will be essential for addressing the region's epidemiological profile. Future studies should examine workforce outcomes, including specialty distribution, retention, and responsiveness to national health priorities.

Digital transformation offers significant opportunities for enhancing medical education. Simulation, learning analytics, and AI-supported tools have the potential to improve personalized learning and assessment precision. Nevertheless, further research is required to evaluate their effectiveness, scalability, and ethical implications within regional contexts.

Regional collaboration across GCC countries represents an important opportunity for advancing medical education quality. Harmonization of competency frameworks, shared assessment strategies, and coordinated faculty development initiatives could strengthen the system-level efficiency and consistency.

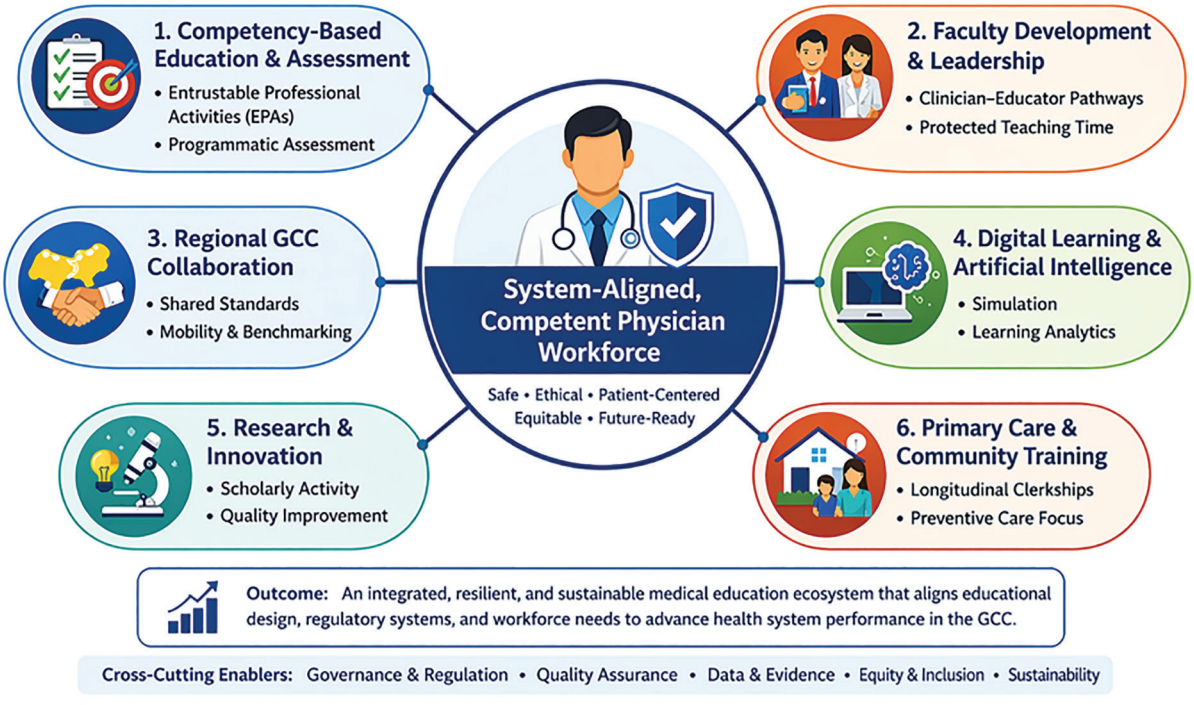

Figure 3. Integrated medical education system alignment framework in the GCC region
This figure illustrates a conceptual framework outlining the key interacting domains required to develop a competent, system-aligned physician workforce in the GCC. At the center is the physician workforce, supported by interconnected domains including competency-based education and programmatic assessment, governance and regulatory systems, faculty development and leadership, digital and AI-enabled learning, primary care and community-based training, research and innovation, and regional collaboration. These domains function synergistically to align educational design with regulatory oversight and health workforce needs. The framework emphasizes that sustained advancement in medical education depends on coordinated integration across systems, consistent implementation, and data-informed evaluation.

Comparative and multicountry research would be particularly valuable in identifying best practices and contextual differences.

Finally, there is a clear need for more robust and standardized outcome data across the region. Current evidence remains predominantly descriptive, with limited longitudinal data on graduate competence, readiness for practice, and healthcare impact. Strengthening regional research capacity and data systems will be essential for supporting continuous improvement and evidence-based policy development.

Study limitations

This review has several limitations that should be considered when interpreting the findings. The available literature across GCC countries is uneven in depth and representation, with Saudi Arabia contributing a larger proportion of peer-reviewed evidence compared with other states. Much of the existing literature is descriptive or policy-oriented, with limited standardized outcome data on educational effectiveness, graduate competence, and workforce impact.

From a methodological perspective, the narrative review design, while appropriate for integrating diverse evidence sources, does not employ formal systematic review protocols or comprehensive quality appraisal tools. Source selection was, therefore, guided by relevance, credibility, and policy significance rather than rigid inclusion frameworks, which may introduce interpretive bias.

Additionally, restriction primarily to English-language sources may have excluded some locally relevant materials. Despite these limitations, the structured thematic approach provides a coherent and context-sensitive synthesis with direct relevance to policy and system-level understanding of medical education in the GCC.

Conclusion

Medical education in the GCC region has undergone a significant transformation, evolving from rapid expansion of institutions and training capacity toward increasingly structured, regulated, and competency-oriented systems. Substantial progress has been made in strengthening accreditation frameworks, modernizing curricula, expanding simulation-based learning, and establishing national licensure mechanisms that enhance accountability and standardization.

Despite these advances, the transition from

expansion to consistent educational excellence remains incomplete. Persistent challenges related to variability in implementation, faculty capacity, assessment balance, and alignment with workforce needs highlight the complexity of translating structural reform into measurable outcomes. These findings underscore the need for a more integrated approach that connects educational design, regulatory systems, faculty development, and health workforce planning.

Looking forward, the future of medical education in the GCC will depend on its ability to move beyond structural growth toward outcome-driven, system-aligned, and sustainable models. Strengthening programmatic assessment, investing in faculty development, expanding communitybased and primary care training, and leveraging digital innovation will be central to this transition. At the same time, enhanced regional collaboration and improved data systems will be essential for supporting evidence-informed policy and continuous improvement.

With sustained commitment and strategic alignment, the GCC has the potential to develop a medical education ecosystem that is not only regionally responsive but also globally competitive, capable of producing a competent, resilient, and socially accountable physician workforce aligned with evolving healthcare needs.

Author Contributions

M.MM: Conceptualization, data collection, analysis, writing original draft, Proofreading and review, Corresponding author; AH.AH: Data collection, analysis, proofreading and review; AM.A: Conceptualization, data collection, analysis, proofreading and review; AM. ASh: Data collection, analysis, proofreading and review; M.A: Data collection, analysis, proofreading and review; MMS.A: Data collection, analysis, proofreading and review; AY.AA: Data collection, analysis, proofreading and review; S.MM: Data collection, analysis, drawing of figures, organization of data and tables, proofreading and review; M.J: Data collection, analysis, organization of data and tables, proofreading and review; J.A: Data collection, analysis, redesign of figures, organization of data and tables, proofreading and review; M.O: Data collection, analysis, proofreading and review.

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Conflict of Interest

The authors declare no conflict of interest.

Declaration of AI Use

Artificial intelligence-assisted tools were used only for language refinement and organizational support. All intellectual content, interpretation, and final approval were performed by the authors.

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