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# Strategies To Overcome Language Barriers For Native Arabic Speakers In English-Dominant Medical Curricula—A Review.

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***Abstract:***
*The globalization of medical education has led to a significant increase in the number of non-native English-speaking students pursuing medical studies in English-speaking countries. Among these students, Arabic-speaking learners face unique challenges due to linguistic differences. This literature review synthesizes existing research to identify the key challenges encountered by Arabic-speaking students in English medical education and explores strategies to address these challenges.*
*This review revealed that to ensure the success of native Arabic speakers in English-based medical programs, a comprehensive approach is vital. By incorporating effective pedagogy, advancements in technology, and the potential of artificial intelligence (AI), educational outcomes can be significantly improved. Interactive learning approaches such as problem-based learning and virtual simulations, coupled with tailored language support and technological tools such as e-learning platforms, can revolutionize the educational experience for these students. AI has the potential to create adaptive learning environments that cater to individual student needs and tutors, create interactive resources, and provide immediate feedback. By integrating these strategies and technologies, educators can create a supportive, inclusive learning environment that promotes the success of native Arabic speakers in their medical studies and future careers and equips them with the skills required to deliver optimal healthcare in a global context.*

***Keywords:*** *Medical education, English, Native Arabic speaker, Learning*

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## I. Introduction

English has become the dominant language in the field of medical education, with many universities and medical institutions worldwide utilizing English as the medium of instruction[1-3]. This poses a significant challenge for native Arabic speakers who are pursuing medical education in English. The urgency of addressing linguistic barriers for native Arabic speakers in English-based curricula is further underscored by the current geopolitical unrest, particularly the war in Sudan, which has precipitated a significant displacement of students4. These students, often compelled to interrupt their education and relocate to English-speaking countries, face the daunting challenge of adapting to an entirely new educational system while grappling with the trauma of war and displacement. An abrupt transition exacerbates the linguistic hurdles these Arabic-speaking students encounter, significantly impacting their academic performance and psychological well-being[4,5]. While few studies have advocated the benefits of instruction in the mother tongue[6-8], this paper specifically seeks to explore the pedagogical strategies that are most effective in overcoming the linguistic hurdles faced by such native Arabic speakers in English-based curricula.

The significance of this research stems from the growing body of literature suggesting that language proficiency not only affects academic achievement[6,9], but also plays a pivotal role in the integration and psychological well-being of students in foreign educational contexts[4,10]. By synthesizing current research findings and examining case studies across various disciplines within higher education, this study aims to illuminate the pedagogical practices that significantly enhance learning outcomes for native Arabic speakers in medical schools.

## II. Methodology

The screening approach was divided into two parts, according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards[11], title and abstract screening, and eligibility testing.

Inclusion criteria for studies were based on the PICOS (population, intervention, comparison, outcome, and study design) framework. Studies from any country, English speaking or otherwise, were included if they were conducted among medical students, used an intervention in the experimental group native Arabic speaking group, involved a comparison of English speakers, included quantitative outcomes with respect to knowledge assessed with either subjective or objective evaluations, and were randomized controlled trials or nonrandomized studies (which are widely used in health education). Only studies published in English were included.

A systematic search of PubMed's and Medline extensive medical literature database was conducted using the keywords "English-based medical curriculum," "medical education," "native-Arabic speakers," "teaching," and "pedagogy". The searches were conducted on English language articles published between January 2000 and December 2023. The timeframe selected helped to identify the most contemporary literature to ensure that the conclusions were relevant to the present study.

## III. Results

The database search produced 56 records that were subjected to the screening process. After removing 5 duplicates, review articles (n=14) and irrelevant articles (n=07), the remaining 30 records were downloaded and studied thoroughly. Four of these were excluded because they did not discuss specific pedagogical approaches. Finally, a total of 26 articles from the last 23 years were included in the review (Figure 1).

## IV. Discussion

English has become the preferred language for academic communication in recent decades, making teaching academic subjects in non-English-speaking countries using English as the medium of instruction a global phenomenon[2]. While approximately one-third of foreign medical schools outside the United States and Canada provide instructions in English, only one-fifth of the countries where these institutions are based mention English as an official language[6,12]. Arabic-speaking medical students often face challenges in English-based education due to language barriers, which impact their comprehension of lectures, textbook reading, and peer interactions[5,10]. Specifically, their limited command of English medical terminology complicates understanding and utilization, impeding effective communication and concept comprehension[13]. A few studies[14] have also shown that such language barriers can negatively affect empathy in future doctors.

Hence, addressing this linguistic gap is crucial for enhancing the academic experience and facilitating accurate communication among Arabic-speaking medical students in English curricula programs. This paper has summarized the findings in three sections of curriculum: the use of technology and the role of artificial intelligence.

**The optimal Curriculum**

The most effective pedagogical approach to teaching medical subjects in English to native Arabic speakers is to use a multifaceted strategy[15] that acknowledges the unique challenges faced by native Arabic speakers, including differences in syntax, phonology, and script between Arabic and English[6]. A cornerstone of this pedagogical approach is the use of interactive and immersive learning experiences, such as problem-based learning (PBL), team-based learning (TBL) and simulated patient interactions. PBL, in particular, encourages students to apply their medical and linguistic knowledge in practical scenarios, enhancing both their clinical reasoning and language skills[16,17]. By situating learning in real-world contexts, students can bridge the gap between theoretical knowledge and clinical application, fostering a deeper understanding and retention of medical concepts in a second language.

Additionally, incorporating language support within the curriculum, such as specialized medical English classes or tutoring, can significantly improve the comprehension and academic performance of native Arabic speakers[18]. Most studies agree that these classes should focus not only on medical terminology but also on the nuances of communication in a clinical setting, including patient interaction and the cultural aspects of healthcare delivery[19,20].

Peer support and mentorship programs can additionally aid in the linguistic adaptation process, offering native Arabic speakers the opportunity to learn from peers who have successfully navigated the transition to an English-based medical curriculum[15,21,22]. Through these programs, students can develop their language skills in a supportive, low-pressure environment, which can enhance confidence and academic performance.

While immersive learning experiences, specialized courses and peer support are important, some authors argue that a more traditional approach to teaching medical subjects in English may be more effective for native Arabic speakers[9]. Some critics also suggest that overemphasizing language instruction in a clinical setting might

negate other crucial aspects of healthcare education, such as practical hands-on training and understanding of medical ethics[23]. Additionally, it is suggested that these programs might create dependency rather than promoting independent language skills development, which is a necessary skill for any medical professional[9,23]. Addressing these potential limitations requires careful consideration of students' needs and contexts, as well as ongoing evaluation and adaptation of the curriculum to ensure its effectiveness and accessibility for Arabic-speaking students in English-based medical curricula.

**Leveraging Technology**

Employing technology to teach medical subjects in English to native Arabic speakers offers innovative avenues for enhancing linguistic comprehension and facilitating effective learning[24]. The integration of digital tools and resources can address specific challenges faced by these students, providing tailored support that enhances both language acquisition and medical education. One promising approach is customized e-learning platforms that can deliver interactive content tailored to the linguistic needs of native Arabic speakers[25]. Such platforms often feature multimedia resources, including videos, animations, and simulations, which can help bridge the language gap by providing visual and contextual cues. For instance, platforms such as Lecturio and Khan Academy Medicine offer a wide range of medical lectures and resources in English, some with subtitle options. Incorporating Arabic subtitles or dual-language glossaries directly within these platforms can aid in the comprehension and retention of medical terminology and concepts[1]. Additionally, the incorporation of real-time translation tools and dictionaries within educational resources can aid students in overcoming immediate linguistic barriers. Tools such as Google Translate, though not perfect, can assist in quick translation, while specialized medical dictionaries available online can provide accurate terminology support.

VR and AR technologies offer immersive learning experiences that can significantly benefit medical education for nonnative English speakers[26]. By simulating clinical environments and patient interactions in English, these technologies provide a safe space for students to practice language and clinical skills simultaneously. The immersive nature of VR/AR helps in contextualizing medical vocabulary and concepts and improving language acquisition through practical application[19,20,27].

Medical colleges can also leverage adaptive learning technologies to personalize the educational experience of native Arabic speakers[25]. These technologies adjust the content's complexity and pace based on the learner's progress, focusing on areas of difficulty, whether linguistic or conceptual, ensuring that students receive targeted support that addresses their specific needs. One such example is online platforms such as Anki, which provides different study resources, such as Arabic medical terminologies, which allows international students to exchange study flashcards.

Finally, facilitating peer learning and collaboration[19,20,27] through online forums and tools such as Slack or Microsoft Teams can encourage communication in English within a medical context. These platforms allow native Arabic-speaking students to engage in discussions, work on group projects, and support each other's learning processes, enhancing language skills through social interaction and collaboration.

While technology-based interventions hold promise for addressing linguistic barriers faced by Arabic-speaking students in English-based medical curricula, several limitations must be considered. First, actualizing these practices requires the rigorous training of both faculty and students[28]. Variations in technological literacy among students may impede their ability to effectively utilize digital learning platforms. Second, disparities in access to technology and internet connectivity may exacerbate existing educational inequalities[29,30]. Moreover, concerns about the quality and accuracy of educational content, as well as the limitations of technology in facilitating interpersonal interaction and peer collaboration, pose challenges for language acquisition and cultural integration[28-30]. Addressing these limitations requires careful attention to students' diverse needs and contexts, as well as ongoing evaluation and adaptation of technology-driven approaches to ensure their effectiveness and accessibility.

**The promising role of AI**

Artificial intelligence (AI) presents transformative possibilities for teaching medical subjects in English to native Arabic speakers, offering personalized learning experiences, linguistic support, and interactive content that can adapt to the unique needs of each student[28,31,32].

First, it offers personalized learning pathways that can analyse a student's learning patterns, strengths, and weaknesses to tailor the educational content accordingly[28,31,32]. For instance, an AI system could identify areas where a native Arabic speaker struggles with specific medical terminology or concepts in English and adjust the curriculum to provide additional resources or exercises in those areas. This personalized approach ensures that students receive support precisely where needed, enhancing their understanding and retention of medical subjects.

Second, AI-powered natural language processing (NLP) tools can offer real-time language assistance, translate medical terminology, provide definitions, and even contextualize words and phrases within the medical

field[29,33-35]. These tools can also help with pronunciation, allowing students to hear medical terms pronounced correctly in English, which is crucial for their future interactions in clinical settings. Furthermore, NLP can enable voice-to-text features for students to practice and receive feedback on their spoken English, particularly in the pronunciation of complex medical terminology.

Finally, AI-driven intelligent tutoring systems can simulate one-on-one interactions with an expert, offer explanations, guide students through problem-solving processes, and answer questions in real time[29,30,36,37]. These systems can be designed to understand and respond to queries in both English and Arabic, bridging the language gap and providing immediate support. They can adapt to the student's learning speed, offer more in-depth explanations, or advance faster if the student shows proficiency, making learning more efficient and effective.

However, the integration of AI in educational settings presents a myriad of ethical considerations and challenges. These include ensuring privacy and data security[31,37], mitigating algorithmic bias and promoting fairness, maintaining transparency and accountability in AI-driven decision-making processes[28,32], and upholding ethical standards in the collection and use of student data. Additionally, the ethical use of AI must consider the balance between human and AI interaction, the preservation of educational equity and autonomy, and the promotion of meaningful student engagement and empowerment[29,30,36,37]. Addressing these challenges requires collaborative efforts among educators, policymakers, technologists, and ethicists to develop robust frameworks and guidelines that prioritize students' well-being, rights, and educational outcomes while ensuring the responsible and ethical deployment of AI technologies in education.

## V. Conclusions

In summary, addressing the linguistic and educational needs of native Arabic speakers in English-based medical curricula requires a multifaceted approach, integrating effective pedagogical strategies, technological innovations, and the potential of AI. The adoption of interactive learning methods, such as problem-based learning and virtual simulations, alongside personalized language support can significantly enhance the educational experience and outcomes for these students. Technologies, including e-learning platforms, language learning apps, and AI-driven tutoring systems, offer innovative solutions to overcome linguistic barriers and facilitate a deeper understanding of medical subjects in English. In particular, AI holds promise for creating personalized, adaptive learning environments that can respond to the individual needs of students by providing linguistic assistance, interactive content, and immediate feedback. By leveraging these strategies and technologies, educators can foster an inclusive, supportive, and effective learning atmosphere, enabling native Arabic speakers to thrive in their medical education and future professional endeavours. This holistic approach not only addresses the immediate challenges of language and learning but also prepares students to provide culturally competent care in a global healthcare landscape.

**Declarations**

**Ethics approval and consent to participate:** Not Applicable

**Consent for publication:** Yes

**Clinical Trial number:** Not applicable

**Data availability:** The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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**Author contributions:** MS conceptualised the study design. MS, AP, JM and AKAA analysed the data. MS wrote the first manuscript draft. All authors critically revised the article for important intellectual content and approved of the final manuscript.

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