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RESEARCH ARTICLE

# Chronological evolution of interprofessional education (IPE) in Saudi Arabia: A systematic review

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## Abstract

**Background:** This study aimed to identify the evolution of research conducted over a decade (2013 to 2023) on the facilitators and barriers to interprofessional education (IPE) implementation in healthcare education in Saudi Arabia. **Methods:** The PRISMA model for systematic review was adopted to search the MEDLINE, PubMed, Science Direct, and Google Scholar databases. Boolean operators and keywords were used to retrieve relevant research articles, and data were analysed narratively to describe the research findings. **Results:** Twelve studies were selected for the systematic review, most of which addressed the knowledge and perception of healthcare students and teachers about IPE, showing improved knowledge and favourable perception of IPE over time. However, several barriers to implementing IPE in Saudi Arabia were also reported. Research has emphasised the need for workshops to improve IPE preparedness and facilitate its integration into curricula. **Conclusion:** The knowledge and perceptions of students and teaching faculty towards IPE in KSA have gradually improved. Further studies are recommended to explore the perceptions and readiness of other stakeholders, including curriculum design experts across various healthcare institutes, institutional higher management, clinical site preceptors, and students undergoing clinical training.

## Introduction

Healthcare is becoming increasingly complex and is changing rapidly worldwide, with more emphasis on team-based and interprofessional approaches. Additionally, there has been growing attention on primary care, preventive healthcare, and cultural values, including the social determinants of health (Andermann, 2016). This expanded perspective has led to the development of interprofessional education (IPE) and collaborative practice. Therefore, health professionals must be adequately prepared to lead and work effectively within interprofessional teams, anticipating challenges and fostering collaboration (Saragih *et al.,* 2023).

IPE occurs when two or more professionals learn with, from, and about each other to improve collaboration and the quality of care in academic and work-based settings before and after professional qualification (WHO, 2010).

IPE is increasingly recognised as essential for preparing students for teamwork in innovative care models while also focusing on the quadruple aim outcomes, i.e., population health, patient experience, per capita cost, and provider work-life balance. The WHO has also emphasised incorporating IPE into healthcare curricula with well-defined and aligned learning outcomes, assessments, and teaching strategies that meet the objectives and definition of IPE and consider the educational approaches of each discipline (Reeves, 2016; Madisa *et al.,* 2023). Thus, IPE can be implemented by fostering learning with, from, and about other professions, with the ultimate goal of enhancing collaboration and healthcare quality (WHO, 2010).

A growing body of research suggests that well-structured IPE can positively influence learners' attitudes, knowledge, abilities, and collaborative skills (Darlow *et al.,* 2015; Kirch & Ast, 2015; Rodrigue *et al.,* 2021). Although the number of rigorously planned studies remains limited, evidence supporting IPE's role

in improving clinical outcomes with beneficial effects on professional practice is growing strong (Bridges *et al.,* 2011; Marion-Martins & Pinho, 2020; van Diggele *et al.,* 2020).

IPE is recognised as an educational innovation that complements other advancements to improve healthcare education, patient care, and overall community health (Global Forum on Innovation, 2013). However, many studies have reported barriers to its implementation, including challenges related to the timing and integration of IPE, resource availability, and faculty and student training (Engel *et al.,* 2017; Reid *et al.,* 2018). Regarding the Saudi healthcare system, the government has prioritised the development of healthcare services at all levels—primary, secondary, and tertiary (Almalki *et al.,* 2011). Therefore, significant emphasis has been placed on high-quality medical education, aligning with the objectives of Saudi Vision 2030 (Saudi Vision 2030, 2016).

As in many other countries, the healthcare system in Saudi Arabia is intricate and multidisciplinary. IPE promotes more effective and coordinated healthcare delivery by fostering a better understanding of roles and responsibilities among professionals (Bashatah *et al.,* 2020). Therefore, IPE promises improved patient care by encouraging collaboration and communication among professionals from various disciplines in Saudi Arabia and beyond (Fallatah, 2016; AlRuthia *et al.,* 2023). Moreover, like many other countries, Saudi Arabia has a diverse population with varied healthcare needs (Asmri *et al.,* 2020). IPE prepares professionals to address these needs comprehensively by utilising expertise from various disciplines. Furthermore, it supports professional growth by extending healthcare knowledge and promoting lifelong learning. Through IPE, professionals can improve their problem-solving, collaboration, and communication skills (AlRuthia *et al.,* 2023).

Collaboration between the Ministry of Health and healthcare agencies, the development of state-of-the-art educational facilities, and the promotion of training programmes are some of the initiatives undertaken by the Saudi government to enhance the healthcare sector, improve medical education, and ensure the continuous professional development of healthcare professionals in line with Saudi Vision 2030 (Al-Eisa *et al., 2016;* Al-Qahtani *et al.,* 2016; Saudi Vision 2030, 2016).

Historically, healthcare education in Saudi Arabia was offered exclusively by public universities and medical colleges. However, the private sector now plays a considerable role in providing medical education across the Kingdom (Telmesani *et al.,* 2011). Despite these advancements, no medical institution in the country currently offers interprofessional education (Alqutaibi *et al.,* 2024). Globally, interprofessional collaboration (IPC) and IPE are recognised for their role in improving health outcomes, yet both remain relatively new in Saudi Arabia. Implementing IPE would contribute to fulfilling one of the goals of Saudi Vision 2030, i.e., enhancing the standard and quality of healthcare services (Saudi Vision 2030, 2016).

Although IPE is gaining attention in Saudi Arabia, its successful implementation remains limited, with a lack of awareness among students, faculty, and other stakeholders. Therefore, the current study aims to identify the evolution of research on IPE in Saudi healthcare education over the past decade, identifying its facilitators and barriers.

## Methods

### *Study design*

A literature review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (Page *et al*., 2021) (Figure 1).

The review was structured using the PICO model:

P (Population): Healthcare professionals and students.

I (Intervention): Interprofessional education (IPE) initiatives, programmes, and curricula implemented in Saudi Arabia over time.

C (Comparison): Traditional teaching strategies for healthcare students.

O (Outcome): The evolution, progress, and status of IPE in Saudi Arabia.

The search was conducted using the following keywords: Saudi Arabia, interprofessional education, implementation, readiness, knowledge, perception, healthcare professionals, and healthcare students.

### *Eligibility criteria*

The research team developed eligibility criteria to include or exclude the studies retrieved in the initial phase of the literature search based on the keywords and search strategy.

Studies were included in the final review if they were published in English, addressed IPE, employed a quantitative design, were conducted in Saudi Arabia between 2013 and 2023, and had their full text available online.

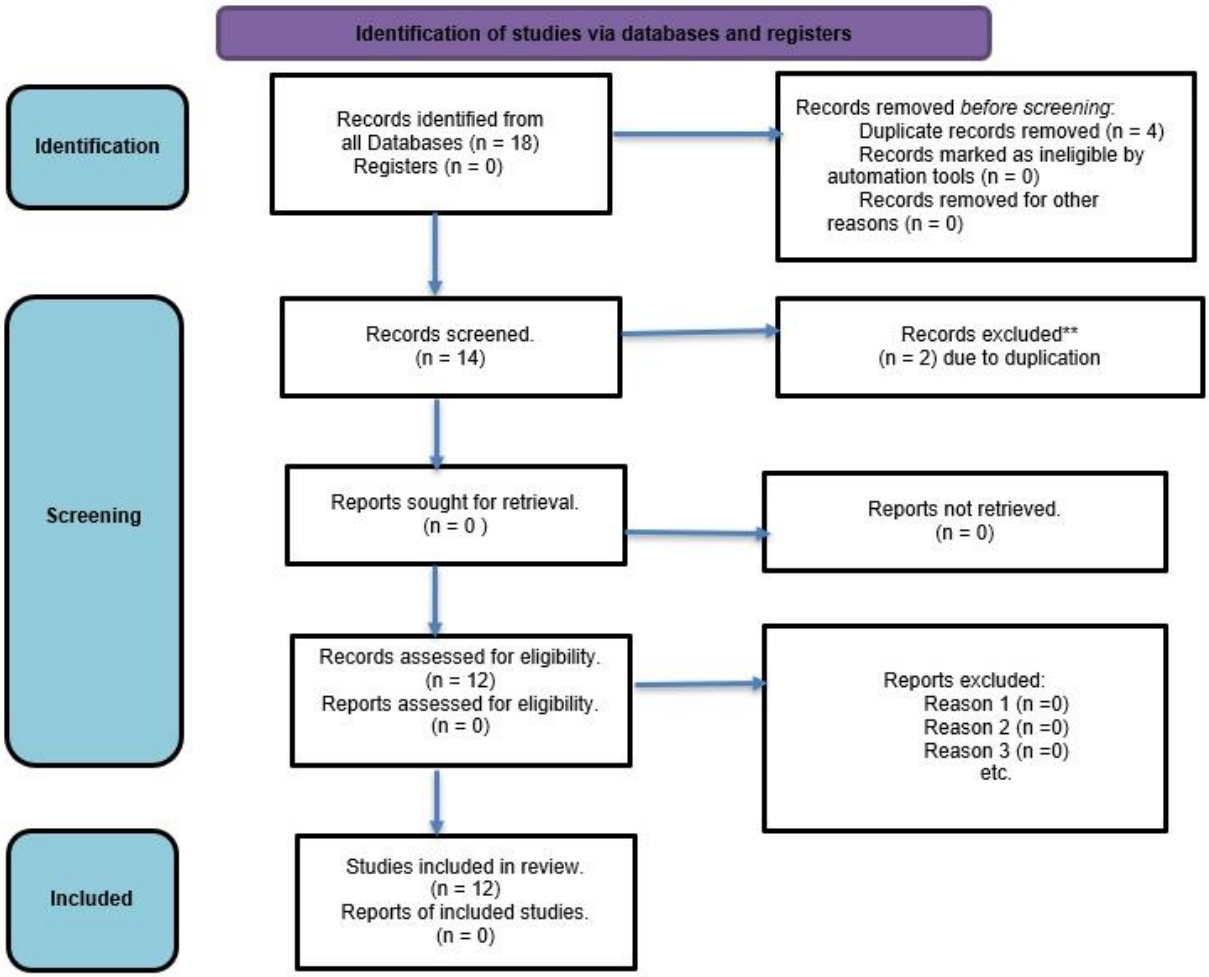


**Figure 1: The PRISMA flow diagram**

This systematic review considers IPE as the foundation of IPC, as reported in previous literature (Stadick, 2020). Therefore, studies were excluded if they focused solely on IPC, combined IPC with IPE, or examined IPE in palliative care. While some literature has used IPE and IPC interchangeably, the present review distinguishes between the two terms, as IPC does not align with the study's main objectives. The study also excluded the review articles, review protocols, and studies conducted in other countries or published in languages other than English.

***Search strategy***

The search was conducted by two researchers across the MEDLINE, PubMed, Science Direct, and Google Scholar databases from November to December 2023, using the predefined keywords. Boolean operators and multiple iterations were applied to ensure the retrieval of all eligible literature.

***Data extraction and quality assessment of literature***

After the initial search**,** two researchers analysed the collected studies to remove duplicates and non-eligible studies. The full texts of the remaining studies were then analysed to confirm their eligibility and facilitate data extraction (Table I). After data extraction, three authors independently reviewed all abstracts and articles to determine their final inclusion in the data synthesis. Barriers and challenges in the included studies were identified, and any discrepancies were discussed until a consensus was reached. Any unresolved concerns were reviewed and adjudicated verbally. Reference lists of relevant articles were also examined to identify additional studies for inclusion. Data were extracted by one author and reviewed by another.

***Data synthesis***

For data synthesis, the extracted data were arranged chronologically (2013-2023) in Table I, summarising the

author, year of study, study origin, study type, study objectives, sample size, study tools, and major findings. The results and discussion sections below present and analyse these findings in chronological order (2013-2023).

## Results

A total of 18 studies were initially retrieved, of which 14 were selected and screened for eligibility. During the full-text analysis of these studies, two articles were excluded due to duplication. Ultimately, 12 studies matched the inclusion criteria (Figure 1).

Of the 12 included studies, 10 focused on students' knowledge and perception, while two examined faculty perspectives (Table I). Eight studies used the Readiness for Interprofessional Learning Scale (RIPLS), two employed the Interdisciplinary Education Perception Scale (IEPS) as a survey tool, and the remaining two used self-developed questionnaires. A study conducted in 2015 on Pharm.D. students measured their attitude scores toward IPE, which were found to be higher compared to other healthcare students. Various factors influenced their attitudes, including years of study, previous work experience, hospital and community training, and attending conferences. Another study conducted in 2016 among healthcare students at King Saud University reported that IPE in education remains a challenge for clinical education providers, although students are optimistic about it. A 2019 study involving healthcare students highlighted the need to improve nursing students' awareness of their roles, attitudes, and the benefits of IPE. Findings from a 2021 study indicated that only 28% of healthcare students demonstrated awareness of IPE, and perceptions of roles and responsibilities varied significantly and lacked clarity. The only study examining healthcare teaching faculty at King Saud University in 2020 reported the need for further research on tools for measuring IPC across university hierarchies and disciplines, as well as on enablers of IPE rather than only barriers (Bashatah *et al*., 2020).

**Table I: Chronological data of studies**

| Title | Author /DOI | Year | Sample | Type of study and tool | Objectives | Major findings |
|---|---|---|---|---|---|---|
| Study investigating pharmacy student interprofessional perceptions toward the pharmacy profession in Saudi Arabia | Khan *et al*. https://doi.org/10.1016/j.cptl.2014.09.019 | 2015 | Pharmacy students | Quantitative Survey /IEPS | To assess Doctor of Pharmacy students' interprofessional perceptions about the pharmacy profession in Saudi Arabia. | Male students and final-year students showed better perception because of having exposure to pharmacy practice, participation in professional workshops and conferences |
| IPE as a need: The perception of medical, nursing students and graduates of medical college at King Abdulaziz University | Fallatah *et al*. http://dx.doi.org/10.4236/ce.2015.62023 | 2015 | Medical, nursing students and graduates of medical college | Quantitative Self-developed questionnaire | To identify the awareness and importance of IPE among medical, and nursing students and graduates at King Abdulaziz University. | The nursing students and the interns recognized IPE as a useful method to improve the competence of healthcare professionals and improve patient and provider satisfaction. |
| The perceptions and readiness toward IPE among female undergraduate healthcare students at King Saud University | Al-Eisa *et al*. https://doi.org/10.1589/jpts.28.1142 | 2016 | Undergraduate female healthcare students | Quantitative Survey/RIPLS | To measure the perceptions and readiness toward IPE amongst undergraduate female healthcare students at King Saud University | Students perceived IPE as a challenge for clinical education. |
| Measuring the attitudes of healthcare faculty members toward IPE in KSA | Al-Qahtani *et al*. https://doi.org/10.1016/j.jtumed.2016.10.001 | 2016 | Health care faculty | Quantitative Survey/RIPLS | To measure healthcare faculty attitudes towards IPE and to measure differences in demographic | There was a gender difference in perception about the role of IPE in the development of healthcare students' competency, |

| Title | Author /DOI | Year | Sample | Type of study and tool | Objectives | Major findings |
|---|---|---|---|---|---|---|
| | | | | | characteristics of faculty for their readiness to incorporate IPE in existing curricula. | understanding of their role in fulfilling the healthcare needs of the community, and the importance of professional collaboration. |
| IPE: Saudi health students attitudes toward shared learning | Al Ahmari *et al*. https://doi.org/10.2147/AMEP.S226477 | 2019 | RC, Nursing, CLS students | Quantitative Survey/RIPLS | To demonstrate the attitudes of students in RC, nursing, and CLS during their last semester before graduating and then beginning their IPE with the help RIPLS scale | The CLS students scored highest among all students while nursing students scored the least. |
| Medical student's readiness and perceptions about IPE: A cross-sectional study | Alzamil *et al*. https://doi.org/10.12669/pjms.36.4.2214 | 2020 | Medical Students | Quantitative Survey/RIPLS | To evaluate the medical students' readiness and Perception of IPE in a Medical College in Saudi Arabia. | The majority of the medical students showed a positive attitude towards IPE and suggested that interprofessional academic events can help to improve the attitude of stakeholders towards IPE. |
| Interprofessional cooperation: An interventional study among Saudi healthcare teaching staff at King Saud University | Bashatah *et al*. https://doi.org/10.2147/JMDH.S279092 | 2020 | Health care teaching staff | Quantitative Pre-post workshop evaluations/IEPS | To explore the attitudes of teaching staff towards interprofessional collaboration in Health at King Saud University, Saudi Arabia. | The healthcare teaching staff showed an overall positive attitude towards IPE, competency autonomy, and cooperation after taking the IPE workshop |
| Perceptions of pharmacy and other Health professional students toward IPE | Ogbaghebriel and AlZeer. https://doi.org/10.5530/ijper.55.3.166 | 2021 | Students of Pharmacy, Medicine, Nursing, Dentistry, and Health and Rehabilitation Sciences. | Quantitative Survey/RIPLS | To assess the readiness and perceptions of pharmacy and other health professional students toward IPE. | Prior knowledge about IPE was low among Pharmacy, Medicine, Nursing, Dentistry, and Health and Rehabilitation Science students. |
| Knowledge and readiness for interprofessional learning among pharmacy and clinical nutrition students at King Saud University | Almazrou and Alaujan https://doi.org/10.2147/JMDH.S360608 | 2022 | Pharmacy and Clinical Nutrition Students | Quantitative Survey/RIPLS | To assess the impact of IPE on pharmacy and clinical nutrition students' knowledge of food–drug interactions and readiness for IPE | RIPLS score increased significantly post workshop indicating a positive attitude toward IPE. |
| Exploring the awareness, attitude, and inclination of healthcare students towards IPE: A cross-sectional study in Saudi Arabia | Makeen *et al*. https://doi.org/10.1016/j.jsps.2023.101784 | 2023 | Medical, pharmacy, nursing, dentistry, allied health, and public health | Quantitative Self-developed questionnaire | Examined IPE in their institutions and students' knowledge and attitudes toward it. | The pharmacy students showed a significantly better awareness and attitude than other disciplines. The study participants suggested faculty training |

| Title | Author /DOI | Year | Sample | Type of study and tool | Objectives | Major findings |
|---|---|---|---|---|---|---|
| Assessment of nursing undergraduates' perceptions of Interprofessional learning: A cross-sectional study | Bashatah https://doi.org/10.3389/fpubh.2022.1030863 | 2023 | Nursing students | Quantitative Survey /RIPLS | To assess the perceptions of IPE among Nursing students in Saudi Arabia. | The participants with previous knowledge of IPE scored significantly better than those without any precious information about IPE. |
| Medical students' perception of IPE: A cross-sectional study | Alghamdi *et al.* https://doi.org/10.7759/cureus.50501 | 2023 | Medical Students | Quantitative Survey /RIPLS | To assess medical students' perceptions of IPE at Taibah University in Saudi Arabia. | Students agreed that IPE improves their communication and collaboration towards better patient care and understanding of clinical problems. |

In 2020, a study among pharmacy and clinical nutrition students used a pre-post workshop survey, revealing improved case-solving abilities when working in teams compared to individually (Almazrou & Alaujan, 2022). However, awareness of roles and responsibilities remained low.

Further supporting these findings, a 2023 study involving students from various health disciplines, including medicine, nursing, dentistry, allied health, and public health, reported that all participants valued the introduction of IPE in the curriculum (Makeen *et al*., 2023. Participants suggested faculty training for effective IPE implementation. A study conducted among medical students at Taibah University found that most participants had a positive attitude towards IPE, with 87.7% strongly agreeing that learning with peers from other disciplines enhances their effectiveness as team members (Alghamdi *et al*., 2023). Similar results were observed in a study on nursing students from three different universities, where 80.4% agreed that interprofessional learning would help them become more effective members of a healthcare team (Bashatah, 2023).

## Discussion

The "*Crossing the Quality Chasm*" report by the Institute of Medicine (IOM) recommends that healthcare delivery be safe, effective, patient-centred, timely, efficient, and equitable (IOM, 2001; Epstein & Street, 2011; Epstein *et al.,* 2010). Achieving these recommendations requires healthcare team members to work collaboratively, one approach being the integration of IPE in healthcare training (Epstein & Street, 2011). Various organisations have highlighted the potential benefits of IPE, including improved healthcare outcomes for elderly populations, outcome-orientated resource allocation (especially in low-resource settings), improved teamwork among various healthcare team members, enhanced quality of patient care, and reduced likelihood of medication errors (Buring *et al.,* 2009; WHO, 2010; Committee on Measuring the Impact of Interprofessional Education on Collaborative Practice and Patient Outcomes *et al*., 2016). Despite these potential benefits, healthcare students often receive profession-specific education and training, with limited opportunities to interact with other healthcare students in their course of education outside of clinical training or internships (van Diggele *et al.,* 2020).

The earliest literature on IPE identified in this systematic review was published between 2015 and 2016 (Khan *et al*., 2015; Fallath *et al*., 2015; Al-Eisa *et al*., 2016; Al-Qahtani *et al*., 2016). During this period, studies assessed the knowledge and perceptions of healthcare students, interns, and residents regarding interprofessional education (IPE) using a quantitative approach. These studies reported that residents had better knowledge and perceptions, likely due to their real-life practice exposure during internships. Additionally, prior participation in academic workshops or training was associated with improved perceptions and knowledge of IPE (Fallatah *et al.,* 2015; Khan *et al.,* 2015; Al-Eisa *et al.,* 2016; Al-Qahtani *et al.,* 2016).

There was no consistent pattern regarding comparative knowledge and perceptions among different healthcare students. However, pharmacy and nursing students demonstrated better knowledge, perceptions, and readiness for IPE than other students. Male students also had a better perception of IPE than females, although the studies did not provide any specific reason for this gender difference. Academic levels or grades did not influence students' perceptions (Fallath *et al.,* 2015; Khan *et al.,* 2015; Al-Eisa *et al.,* 2016; Al-Qahtani *et al.,* 2016). A study in South Korea

reported varying degrees of awareness about IPE among healthcare students, identifying interprofessional communication as the most important skill for IPE (Yune *et al.,* 2020). In contrast, an observational cross-sectional study in Indonesia found that perceptions of IPE were similar across all healthcare disciplines (Orbayinah & Utami, 2015). Only one article within this timeframe measured healthcare faculty attitudes towards IPE using the Readiness for Interprofessional Learning Scale (RIPLS) (Al-Qahtani *et al.,* 2016). Older and more experienced faculty scored better on RIPLS and acknowledged IPE as a valuable strategy to improve interprofessional communication skills and overall healthcare delivery. They also perceived IPE as essential for enhancing effective teamwork among multidisciplinary personnel in a shared healthcare environment.

The next bracket of literature was published between 2019 and 2021 (AlAhmari, 2019, Alzamil & Meo, 2020; Bashatah, 2020, Ogbaghebriel & AlZeer, 2021). These studies explored not only knowledge and perceptions but also the readiness of medical students for IPE. However, only two articles focused on pharmacy students, and none examined the attitudes or willingness of faculty members and health practitioners. Additionally, no study reported the implementation of IPE in the curriculum of any healthcare academic institution in the kingdom. All these studies used RIPLS to collect their responses, showing that sociodemographic variables, such as age, gender, year or level of study, GPA, and awareness of the RIPLS questionnaire, were consistent across studies. The sample size varied considerably, ranging from 48 to 440. Interestingly, all these studies reported a high RIPLS score and a negative score regarding role identity among different health professions, suggesting that healthcare students' understanding of other health professionals' roles needs to be improved through a well-designed IPE curriculum. These studies also reported a high level of readiness among healthcare students for interprofessional learning activities and collaboration during their internships and professional practice. Compared to the earlier literature (2015–2016), this group of studies found no difference in the perceptions, knowledge, or readiness among healthcare students of different academic levels. This shift may be due to the COVID-19 pandemic, which enabled healthcare practitioners to collaborate more closely. The pandemic also broadened the perspectives of healthcare professionals, interns, and students on interprofessional activities and the importance of fostering a culture of cooperation and support among healthcare team members (Donnelly *et al.,* 2021; Gill *et al.,* 2022; Jordan *et al.,* 2022). These studies further highlighted the recognition of healthcare workers for a sustainable workforce.

One study (Bashatah, 2020) identified IEPS as the most used scale for measuring attitudes towards IPE and IPC, as previously reported (McFadyen *et al.,* 2007; Herge *et al.,* 2016; Bonello *et al.,* 2018; Williams *et al.,* 2018). It used a pre-workshop and post-workshop evaluation to determine faculty and teaching staff attitudes towards IPE at King Saud University using the Interdisciplinary Education Perception Scale (IEPS). A presurvey using IEPS was administered, followed by a workshop that covered IPE and IPC fundamental concepts and strategies for curriculum development. Participants had positive attitudes towards IPC in both pre-workshop and post-workshop. However, their attitudes regarding the need to improve teaching competence for IPE and IPC implementation improved post-workshop (Bashatah, 2023). Overall, this study highlighted the importance of institutional support for designing and implementing IPE and IPC. It also reinforced previous findings that workshops and professional development programmes can enhance faculty perceptions and readiness for IPE and IPC (Giordano *et al.,* 2012; Grymonpre, 2016).

Only one article on IPE was published in 2022 (Almazrou & Alaujan, 2022). This study described a one-day interprofessional workshop organised for pharmacy and clinical nutrition students, during which participants took a pre-quiz and attended a lecture about food-drug interactions. Following the lecture, they worked in teams to solve case scenarios in a simulated environment resembling their professional practice. After the workshop, they completed the RIPLS to assess their attitudes towards interprofessional learning. Consistent with previous studies, this research reported positive attitudes and high readiness for IPE. However, participants needed further understanding of the roles and responsibilities of each healthcare member in their professional practice, as reported in earlier studies (Homeyer *et al.,* 2018; Spaulding *et al.,* 2021). Previous studies also recommended adding faculty training and simulation-based activities, including professional role exchange, to traditional IPE sessions to enhance IPE (MacDonald *et al.,* 2010; O'Keefe *et al.,* 2017; Smith *et al.,* 2018).

The next group of reviewed articles was published in 2023. These studies measured the perceptions and attitudes of healthcare students and teaching staff. However, none reported the implementation of IPE activities in the curriculum or their impact on interprofessional practice.

Two studies published in 2023 used RIPLS to measure the perception and readiness of medical and nursing students towards IPE (Bashatah *et al.,* 2020; Alghamdi

*et al.,* 2023). Both studies reported favourable attitudes and willingness towards interprofessional education. Furthermore, they highlighted the perception among medical students that integrating IPE into academic coursework and internship programmes could enhance interpersonal skills, particularly interprofessional communication, and influence the attitudes of stakeholders, including educational institutions, teaching faculty, preceptors, and students, towards IPE. Consistent with international research, these findings reinforce the potential of IPE, interprofessional communication, and collaborative training to enhance healthcare standards (Cleary *et al.,* 2019; Schot *et al*., 2020; Fox *et al*., 2021).

In another study published in 2023 (Makeen *et al.,* 2023), the authors developed and validated their questionnaire before administering it to healthcare students. It was the only study that explored students' perspectives on the growth and implementation of IPE within their institutions. Similar to previous studies, it also examined the knowledge and perceptions of IPE. The findings indicated that participation in various interdisciplinary events such as conferences, workshops, and seminars improved students' knowledge and attitudes towards IPE. However, a notable and unique finding was that some students perceived IPE as overly complex and believed it should not be implemented. At the time of this study, IPE had still not been integrated into the curriculum. Instead, institutions organised interdisciplinary workshops where healthcare students could communicate and collaborate with peers from other disciplines. The study participants strongly favoured a curriculum design that includes IPE to facilitate interaction, coordination, and communication among healthcare students. Additionally, students emphasised the need for faculty, instructors, and preceptors to undergo professional development for effective IPE implementation, aligning with recommendations from previous studies (Silver *et al.,* 2017; Silva *et al.,* 2022; Bogossian *et al.,* 2023).

The establishment and implementation of IPE in Saudi Arabia remain slow and fragmented. While the literature documents a positive response towards IPE, there is no evidence of its incorporation into curricula. Several factors, including the cultural context, institutional approaches and perceptions, staff and faculty training, logistical and financial issues, and the lack of a competency framework, contribute to this shortcoming (Alqutaibi *et al.,* 2024).

### *Limitations*

The study has several limitations, including the exclusion of qualitative studies and systematic reviews. Fewer articles were published specifically on IPE, resulting in a total of only studies, with no publications in 2017 and 2018. A meta-analysis was not performed to compare the results of these studies.

### *Recommendations*

The findings from this systematic review of the chronological evolution of IPE in KSA highlight the need for involving all relevant stakeholders, including the Ministry of Health, the Ministry of Education, educational institutions, healthcare providers, and industries, in the establishment and implementation of IPE in Saudi Arabia. A sustainable workforce should be prepared to conduct IPE in academic institutions. A multi-stakeholder task force should also be created to design a national competency-based IPE curriculum, ensuring uniform national outcomes that contribute to improved healthcare outcomes. Academic institutions should also initiate a pilot IPE programme to assess their preparedness for a fully implemented IPE curriculum. The results of these pilot programmes should be statistically presented to demonstrate their effectiveness, particularly in enhancing patient-centred healthcare.

## Conclusion

This systematic review outlines the scarcity of literature on interprofessional education (IPE) in the Kingdom of Saudi Arabia and the limited information on the development and implementation of IPE. The available studies primarily evaluated the knowledge, perceptions, attitudes, and readiness of healthcare students and teaching staff towards IPE. However, they did not assess the readiness of clinical preceptors or the perceptions and attitudes of curriculum development committee members and higher management within educational institutions (universities/colleges) and healthcare facilities (primary, secondary, or tertiary). These studies did not examine whether existing faculty in academic institutions can teach an IPE-based curriculum or if specially trained teaching staff are needed. The barriers identified included challenges in implementing IPE, measuring its effectiveness, and ensuring the availability of trained faculty and preceptors.

## Conflict of interest

The authors declare no conflict of interest.

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