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## Perceptions of medical students in Pakistan, KSA, and the US regarding the significance of case-based learning

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### المخلص

**أهداف البحث:** تهدف هذه الدراسة إلى تحديد تصورات طلاب الطب الباكستانيين والسعوديين والأمريكيين حول أهمية التعلم القائم على الحالات.

**طرق البحث:** تم جمع البيانات لهذه الدراسة المقطعية بواسطة استبانة على الإنترنت وزعت على طلاب الطب الباكستانيين والسعوديين والأمريكيين.

**النتائج:** شارك في هذه الدراسة ما مجموعه 344 طالباً في كلية الطب. وافقت أغلبية كبيرة من الطلاب على أن استراتيجية التعلم القائم على الحالات مهتد الطريق في تطوير فهم سليم للمواد الأساسية. كما قدم التعلم القائم على الحالات رؤى في واقع التجربة، وساعد على تحويلها من حفظ الحقائق إلى حل المشاكل، وأبقاهم مشاركين خلال الحصص، ومثل هذه الحصص حفزت حضور المزيد من هذه الأنشطة. وأظهرت مقارنة بين الطلاب الباكستانيين والسعوديين أن برنامج التعلم القائم على الحالات يعزز التفكير العميق ويعزز تفكيرهم النقدي. ومع ذلك، هناك اختلاف في التصورات في بعض الفئات؛ بين التعلم القائم على الحالات كأداة لفهم المفاهيم الرئيسية، والتعلم القائم على الحالات لتقديم رؤى في واقع الحياة الخبرات، وفي تقديم منصة للتعلم الموجه ذاتياً، ورعاية القدرات التعاونية، وفي الحفاظ على مشاركة الطلاب.

**الاستنتاجات:** أظهرت دراستنا أن استراتيجية التعلم القائم على الحالات هي أداة تعلم فاعلة بين مجموعة مختارة من طلاب الطب. وكان غالبية الطلاب إيجابيين للغاية تجاه التعلم القائم على الحالات. كما تقترح هذه الدراسة تقديم التعرض السريري المبكر لطلاب الطب خلال برنامج بكالوريوس الطب والجراحة، الذي سيساعد على تعزيز المهارات التعاونية والتعلم الموجه ذاتياً في طلاب الطب.

**الكلمات المفتاحية:** التعلم الذاتي؛ مهارات تعاونية؛ حل المشكلات؛ التعلم العميق؛ التعلم القائم على الحالات

### Abstract

**Objective:** This study aims to determine the perceptions of medical students in Pakistan, KSA, and the US regarding the significance of case-based learning (CBL).

**Methods:** For this cross-sectional study, data were collected by administering an online questionnaire to students in medical schools across Pakistan, KSA, and the US.

**Results:** A total of 344 medical students participated in this study, the great majority of whom agree that CBL paves the way for developing a sound understanding of the core subject, provides insight into real-life experiences, helps them transform from fact memorisers into problem solvers, and keeps them engaged during sessions, which motivates them to attend more of these. A comparison of respondents from Pakistan and KSA shows that CBL promotes deep learning and fostered their critical thinking; however, there was a difference in perception in some categories, including CBL as a tool used for grasping key concepts ( $p = 0.004$ ), providing insight into real-life experiences ( $p = 0.001$ ), offering a platform for self-directed learning ( $p = 0.000$ ), nurturing

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collaborative abilities ( $p = 0.004$ ), and maintaining students' engagement ( $p = 0.002$ ).

**Conclusion:** Our study shows that the selected cohort of medical students perceive CBL as an effective learning tool, as the majority feel overwhelmingly positive towards it. This study thus proposes the introduction of clinical exposure for medical students early in MBBS programmes, which will help promote collaborative skills and self-directed learning among them.

**Keywords:** Case-based learning; Collaborative skills; Deep learning; Problem solving; Self-directed learning

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## Introduction

Medical education is one of the most challenging fields and requires a lot of time, commitment, zeal, and focus. Subject matter mastery depends on students' attitudes towards learning.<sup>1</sup> Jamil et al. (2019) state that certain instruction modalities, such as case-based learning (CBL) and problem-based learning (PBL), force medical students to open up their textbooks to gather required information.<sup>2</sup>

CBL is widely used as a learning tool during the clinical and initial years of medical studies worldwide.<sup>3</sup> Twenty years ago, in most medical schools across Pakistan, the assessment focus was mainly based on extensive essay questions, with little emphasis on CBL, especially in basic medical sciences. However, there has been a paradigm shift over the last two decades, as multiple choice questions (MCQs) and clinical scenario-based questions are now frequently used in both formative and summative assessments.

Both, to cater to the need to equip future doctors and nurses<sup>4</sup> with the art of problem solving and to better prepare them for their summative assessment, the significance of CBL cannot be understated. Since CBL has been adapted from PBL, it engages students in student-centred, self-directed peer learning, where students solve problems through knowledge exchanges and by consolidating their understanding of basic medical science core principles. Further critical evaluation of current literature on the significance of CBL in a pre-hospital setup using several databases shows that the CBL modality as a whole has been enjoyed by both the teachers and students involved.<sup>5</sup>

Gul et al. (2020) demonstrate that CBL promotes a 'deep learning approach' among basic sciences students and consider it a valuable strategy for teaching subjects.<sup>6</sup> Kaur et al. (2020) reported significant improvement in student presence in CBL sessions, although there was no difference in their test marks; they further express that the majority of the students found CBL to be a superior teaching method to traditional teaching and were more involved and more inspired because of it.<sup>7</sup> There is abundant literature on the use of CBL among undergraduate medical students.<sup>7–10</sup>

The use of active learning strategies, including CBL, is increasing in medical education. For a long time in countries like Pakistan, the traditional method of teaching (lecture-based) was prevalent in all institutions. However, recent developments in medical education and greater awareness of teaching and learning strategies have compelled institutions to adopt new methods and incorporate more active learning strategies for medical students. In this context, the present study is designed to explore and compare the perceptions of medical students in Pakistan with those of their counterparts in KSA and the USA.

## Materials and Methods

This cross-sectional study was conducted in different medical colleges across Pakistan and with the Faculty of Medicine Rabigh at the King Abdul Aziz University in Jeddah, KSA, and also included students of various US medical schools (data were collected at the Avalon University School of Medicine USA by a 4th-year student during a joint session where medical graduates of different schools across the US participated). This study was conducted between February 2020 and September 2020 after receiving approval from the Institutional Review Board of CMH Kharian Medical College, Kharian, Punjab, Pakistan. Data were collected after obtaining the students' consent, and their confidentiality was ensured.

A digital version of the questionnaire was distributed among the medical students. Questions designed to evaluate the learning outcomes of CBL were formulated based on the Dundee model of medical teaching,<sup>11</sup> keeping in mind the parameters of the cognitive processes of Bloom's revised taxonomy for knowledge.<sup>12</sup> The *pro forma* content was circulated among the students, and their responses (agree) were collected and compared. Students from all 5 years have been represented in the study.

In Pakistani medical colleges, the procedure to implement CBL is as follows. A pre-structured case scenario outlined by learning objectives (LOs) is provided to students 1 week prior to CBL. On the CBL day, students discuss the LOs with each other in the presence of a facilitator. At the end of the session, MCQs (10–15) and extended matching questions are provided to assess the students' knowledge. Each student group comprises 10–12 students, and the group leader and scribe from each are nominated before the start of the session. Each group is given half an hour; after this, the leaders present their respective group's answers, and then a discussion among the students is allowed to commence, with intervention from the facilitator limited to when a group strays from the main theme. A similar trend, with minor changes, is followed in Saudi medical schools, although the frequency varies from once a week to once a month. However, in US medical schools, this process is followed more frequently—each lecture session comprises multiple case scenarios, incorporated in a digitally formulated manner, where a case is presented to the class, and students then engage in a discussion. The class is oriented towards the topic 1 week prior to the discussion. As one group had less than 30 participants in the Likert scale analysis, we followed the criteria mentioned by Conroy (2016).<sup>13</sup>

Data analysis

The collected data were analysed using Excel and SPSS-24. The quantitative data are presented as frequencies and percentages. A chi-square test was carried out to analyse the comparison of responses from the students in Pakistan and those in KSA. A p-value of <0.05 was taken as significant.

Results

A total of 344 students responded—211 studying in medical colleges (both government and private) in Pakistan, 111 in KSA, and 22 in the US. The students' general characteristics are given in Table 1. More than three-fourths of the respondents agree that CBL promotes deep learning, helps them transform from fact memorisers into problem

**Table 1: General characteristics of the respondents.**

	Pakistan N = 211	KSA N = 111	US N = 22
<b>Gender</b>	197 responses	52 responses	22 responses
Male	95 (45,02%)	27 (24,32%)	12 (54,54%)
Female	102 (48,34%)	25 (22,52%)	10 (45,45%)
<b>Year of study</b>			
1st year MBBS	48 (22,74%)	20 (18,01%)	—
2nd year MBBS	59 (27,96%)	38 (34,23%)	—
3rd year MBBS	46 (21,80%)	15 (13,51%)	—
4th year MBBS	32 (15,16%)	34 (30,63%)	20 (90,90%)
Final year MBBS	26 (12,32%)	04 (3,60%)	02 (9,09%)

**Table 2: Responses on the significance of case-based learning.**

Parameters	Agree (responses from Pakistan) N = 211	Agree (responses from KSA) N = 111	Agree (responses from the US) N = 22
It promotes deep learning and helps develop critical thinking.	191 (90,52%)	98 (88,28%)	14 (63,63%)
It is an effective tool for grasping key concepts.	207 (98,10%)	90 (81,08%)	18 (81,81%)
It paves the way for developing a sound understanding of the core subject.	172 (81,51%)	92 (82,88%)	21 (95,45%)
It provides insight into real-life experiences.	183 (86,72%)	84 (75,67%)	21 (95,45%)
It is a useful tool that helps medical students transform from fact memorisers into problem solvers.	190 (90,04%)	94 (84,68%)	21 (95,45%)
It provides a platform for self-learning.	164 (77,72%)	80 (72,02%)	19 (86,36%)
It nurtures collaborative abilities.	167 (79,14%)	81 (72,97%)	18 (81,81%)
It keeps me engaged during the sessions.	167 (79,14%)	87 (78,37%)	20 (90,90%)
I would like to attend more CBL sessions.	164 (77,72%)	87 (78,37%)	20 (90,90%)

**Table 3: Comparison of the perceptions of respondents from Pakistan and KSA regarding the significance of case-based learning.**

Parameters	Country	Agree N (%)	Disagree N (%)	p-value
It promotes deep learning and helps develop critical thinking.	Pakistan	201 (95,26%)	10 (4,73%)	0.537
	KSA	103 (93,63%)	7 (6,36%)	
It is an effective tool for grasping key concepts.	Pakistan	200 (94,78%)	11 (5,21%)	0.004
	KSA	94 (85,45%)	16 (14,54%)	
It paves the way for developing a sound understanding of the core subject.	Pakistan	198 (93,83%)	13 (6,16%)	0.044
	KSA	96 (87,27%)	14 (12,72%)	
It provides insight into real-life experiences.	Pakistan	199 (94,31%)	12 (5,68%)	0.001
	KSA	91 (82,72%)	19 (17,27%)	
It is a useful tool that helps medical students transform from fact memorisers into problem solvers.	Pakistan	197 (95,26%)	14 (6,63%)	0.001
	KSA	98 (89,09%)	12 (10,90%)	
It provides a platform for self-learning.	Pakistan	201 (95,26%)	10 (4,73%)	0.000
	KSA	88 (80%)	22 (20%)	
It nurtures collaborative abilities.	Pakistan	195 (92,41%)	16 (7,58%)	0.004
	KSA	90 (81,81%)	20 (18,18%)	
It keeps me engaged during the sessions.	Pakistan	193 (91,46%)	18 (8,53%)	0.002
	KSA	87 (41,23%)	23 (10,90%)	
I would like to attend more CBL sessions.	Pakistan	192 (90,99%)	19 (9,00%)	0.082
	KSA	93 (84,54%)	17 (15,45%)	

solvers, helps with grasping key concepts, provides insight into real-life experiences, nurtures collaborative skills, keeps them engaged during the sessions, and provides a platform for self-learning (Table 2).

A comparison of the respondents from Pakistan and KSA shows that both groups agree that CBL promotes deep learning and helps with critical thinking, and they expressed their interest in attending more CBL sessions. However, there was a difference in perception in a few categories: CBL used as a tool to grasp key concepts ( $p = 0.004$ ), provide insight into real-life experiences ( $p = 0.001$ ), help medical students transform from fact memorisers into problem solvers ( $p = 0.001$ ), provide a platform for self-learning ( $p = 0.000$ ), nurture collaborative abilities ( $p = 0.004$ ), and keep students engaged during the sessions ( $p = 0.002$ ) (Table 3).

## Discussion

CBL provides a platform for interlinking basic medical science core concepts with real-life clinical scenarios. It fosters communication skills based on discussions among small groups and nurtures a sense of responsibility in accomplishing an allocated task in a self-directed study mode.

When it comes to agreeing that CBL promotes deep learning and critical thinking, respondents from the US (63,63%) lagged behind their counterparts in KSA (88,28%) and Pakistan (90,52%). The retention of acquired knowledge involves students' ability to reproduce what they have learned. A study among undergraduate biochemistry students tested retention and found that those who took part in CBL sessions retained key concepts of the subject better than those who did not engage in this teaching methodology.<sup>14</sup>

The basis of CBL scenarios is in line with the Dundee model of undergraduate medical education,<sup>5</sup> where the emphasis is on producing problem-solving doctors rather than fact-memorising ones, further fostering deep learning and critical thinking. The finding related to the proportion of respondents from the US (63%) agreeing that CBL promotes deep learning and critical thinking is unexpected. This could be attributed to the trend to cram less among school, college, and then in US-based medical students. The cramming culture East Asian students grow up in results in them developing the ability to reproduce teachers' notes and content in books. The race to achieve good grades on exams leads to rote learning,<sup>15</sup> which might give a false perception of better deep learning at the cost of critical thinking.

Respondents from all three countries had a positive perception of CBL's role in developing an understanding of the core subject, providing insight into real-life experiences, helping medical students transform from fact memorisers into problem solvers, keeping students engaged in sessions, and nurturing a culture of self-directed learning (SDL). However, the proportion of undergraduate medical students from the US agreeing with the above-mentioned parameters was higher (90% and above) when compared with that of their counterparts KSA and Pakistan. This might be due to the representation of only 4th- and final-year students from the US as opposed to a higher number of 1st- to 3rd-year students than 4th- and final-year ones from KSA and Pakistan; that is, 4th- and final-year medical students can better correlate different systems, already have

some clinical rotation experience, and are well equipped to extract CBL's benefits. Overall, the respondents from KSA appreciated the CBL approach; this could be because in almost all KSA medical colleges, an integrated curriculum has been implemented, and more active learning approaches—including CBL, team-based learning, PBL, and SDL—are being used.<sup>2,16</sup>

Today, students in KSA find CBL more enjoyable because most medical students have medical apps on their smart devices and use them to explore answers to LOs and to search for other medical information.<sup>17</sup> A Saudi study reported higher stress levels among medical students due to extensive curriculum, frequent periodical tests, and discontentment with the didactic lectures. They emphasise that efforts should be made to incorporate more active teaching and learning activities.<sup>18</sup> Assessment of learning is a critical issue in medical education, and there is a need to adjust our assessment tools in accordance with active learning strategies. Many studies have shown that by avoiding resources that evaluate higher levels of cognition, students can follow shallow learning and memorisation approaches.<sup>19,20</sup> Therefore, it is necessary to use such evaluation instruments that enhance students' in-depth learning. All active learning strategies promote deep knowledge of the subject.<sup>21</sup>

CBL works wonders for students in the US when compared to their peers in KSA and Pakistan, which could be attributed to the electronic or digital presentation of cases. A patient's clinical background with presenting symptoms and complaints can better be shown using a digital format than paper. This is in line with the findings of Balslev et al. (2015), who documented that video recording showed posture and movements in a better way in developing an understanding of a case when compared with the text or paper version.<sup>22</sup> A lack of electronic journal access and a reliance on paper format CBL conduction in Pakistan might lead to the difference among Pakistani and US-based medical schools.

Visual and auditory learning styles should be used in combination alongside a simulator,<sup>23</sup> and by doing so, a triangle can be achieved in which learning by doing takes centre stage in enhancing the learning process.<sup>24</sup> In this study, a staircase increment is found in the percentage of students (72,02% KSA; 77,72% Pakistan; and 86,36% US), coupling the promotion of self-learning and CBL. This trend might be attributed to greater financial independence among students in the US when compared with their counterparts in Pakistan and KSA, as financial independence creates a better sense of responsibility.<sup>25</sup>

No significant difference was observed among many of the responses from Pakistan and KSA regarding CBL in promoting deep learning and critical thinking; they expressed their interest to attend more CBL sessions. This shows that students from both countries realise the substantial impact of CBL in the process of learning. However, there was a difference in perception in a few categories: CBL used as a tool to grasp key concepts, provide insight into real-life experiences, help medical students transform from fact memorisers into problem solvers, provide a platform for self-learning, nurture collaborative abilities, and keep students engaged during the sessions. At present, we do not have a specific explanation for the differences in response to this; however,

this could be due to the number of respondents from KSA being less than those from Pakistan.

Since the medical profession is evolving rapidly, there is a demand to inculcate self-directed, lifelong learning to keep medical graduates and future physicians updated in terms of their skills and competency and to equip them with self-learning strategies once formal schooling ends.<sup>26</sup>

This study's strength is that it shows that CBL is an important tool for acquiring applied knowledge of basic medical sciences. It provides a generalised overview of the perceptions of diverse groups of students in different countries. This helps provide an understanding of medical students' perceptions of CBL.

This study has a few limitations, such as the sample size being insufficient for generalising the results. Furthermore, as there were more students from preclinical sciences, a comparison of clinical and preclinical sciences is not possible. In addition, because the number of respondents from the US was low, they had to be excluded from the chi-square analysis; we did not compare their performance in tests or exams after they attended CBL sessions.

### Conclusion

This study shows that CBL is an effective learning tool for medical students in all 5 years of the MBBS programme across Pakistan, KSA, and the US. The majority of students in all years perceive CBL as a tool that facilitates their transformation from fact memorisers into problem solvers, provides insight into real-life experiences, promotes deep learning, nurtures collaborative skills, and keeps them engaged during the sessions.

### Recommendations

It is recommended to initiate medical students' clinical exposure right from the first year of MBBS to achieve maximum benefits from CBL in the clinical setup. There is also a need to reformulate and restructure CBL implementation in Pakistan from a paper-based format to a digital one, with available material related to presenting symptoms and complaints shown in a visual format, owing to the possibility that the retrospective patient journal in the electronic format might cultivate more SDL. Further studies to compare the trend at the national level are recommended.

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### Conflict of interest

The authors have no conflict of interest to declare.

### Ethical approval

This study was approved by the ethical review committee of CMH Kharian Medical College with approval no. (diary number):5b, dated 17.01.2020.

### Authors contributions

AMK conceptualised the study, analysed the data, formulated the initial draft, and proofread it; MS collected the data and contributed to formulating the discussion section and proofreading; IN contributed to writing the methods section and formulating the graphics; HK contributed to the data collection, writing of the discussion section, and proofreading; MR contributed to the data collection, methods, and proofreading; and MB contributed to the data collection, writing of the discussion section, and proofreading. All authors have critically reviewed the manuscript and approved the final draft and are responsible for the content and similarity index of the manuscript.

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