


ORIGINAL ARTICLE

Self-perceived comfort in performing basic life support among medical students in Saudi Arabia: a cross-sectional study

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ABSTRACT

Background: High quality and immediate initiation of cardiopulmonary resuscitation (CPR) can contribute to improving the survival rates and outcomes of cardiac arrests. As for medical students, it is important that they are fully qualified to appropriately apply basic life support (BLS). This study aimed to assess the level of theoretical knowledge and self-perceived comfort of medical students in Saudi Arabia in performing lifesaving CPR.

Methods: A cross-sectional study which included medical students from the third to sixth academic years from the five main regions of Saudi Arabia. The selection of participants was done through nonprobability convenience sampling. Data were collected using a questionnaire that consisted of sections on BLS knowledge and self-perceived confidence/comfort.

Results: A total of 1,372 participants were included in the study, of which 745 (54.3%) were female. The majority were not BLS license holders, $n = 771$ (56.2%). Male students reported a higher self-perceived comfort of 2.99 (CI 2.89 to 3.10). The relationship between the self-perceived comfort score and gender was statistically significant ($p = 0.004$). The northern region had the highest self-perceived comfort mean, 3.14 (CI 2.98 to 3.30), with a significant p -value ($p < 0.001$). A moderate correlation was found between self-perceived comfort and BLS theoretical knowledge with $r = 0.39$.

Conclusion: BLS knowledge and comfort in providing CPR were found to be low and positively correlated among medical students in Saudi Arabia. Therefore, adding BLS training to the medical education curriculum and extensive simulation sessions with advanced models would be encouraged to reach a level where medical students exhibit high comfort with their willingness to perform CPR.

Keywords: Cardiopulmonary resuscitation, CPR, cardiac arrest, medical student, self-perceived comfort, level of knowledge.

Introduction

Cardiac arrest is the abrupt loss of heart function in a person who may or may not have been diagnosed with heart disease [1]. With mortality rates of 80%-85%, it is considered as the leading cause of preventable deaths worldwide [2,3]. Globally, the reported annual incidence of out-of-hospital cardiac arrest (OHCA) is 55/100,000 [4]. In the United States alone, more than 450,000 deaths due to OHCA are documented every year [5]. These numbers reflect the poor outcomes of OHCA around the world [6]. However, according to existing literature, high-quality and immediate initiation of cardiopulmonary resuscitation (CPR) can contribute toward improved survival rates and outcomes in cardiac arrest patients by reducing the risk of hypoxic damage [4,7]. It has been

reported that the duration between call-for-assistance by the affected parties till the arrival of medical care services at the scene of the accident can exceed 8 minutes; hence, it is vital that the majority of the general populace are adequately trained in performing CPR with competence,

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in the heat of the moment. This could prove to be the tipping point in survival or otherwise loss of life or diminishing the quality of life. Therefore, this implication signifies the importance and criticality of CPR training to the layman, who is nonrelated to the medical field [8].

It is crucial for medical students to be fully qualified not only in the theoretical aspect, but also in the appropriate application of basic life support (BLS). BLS consists of a series of assessments that include checking for possible hazards at the scene, the level of the patient's consciousness, and the ability to initiate the emergency protocol. In addition, it is crucial to examine the patient for airway patency and breathing patterns. In the case of a nonresponding patient with sudden cessation of breathing, chest compressions, rescue breathing, and the use of an external defibrillator, if available, should be initiated [9]. Medical students are future practitioners, so it is imperative that they can perform high-quality CPR, which requires them to be confident in doing so. In a study conducted on healthcare students in Riyadh, Saudi Arabia, it was found that 87.9% of the participants had poor theoretical knowledge of BLS [10]. It is generally seen that the confidence of conducting CPR varies among medical students of different academic years. For instance, junior medical students who are not yet exposed to clinical practice may demonstrate less confidence than senior students [11]. It is, therefore, essential for medical students with or without a BLS license to observe and engage clinically in CPR performed by certified providers in order to gain confidence and be prepared if they are involved in an emergency scenario [11].

At present, there is a lack of studies discussing the comfort level of medical students in their willingness to perform effective CPR, especially in Saudi Arabia. Therefore, the aim of this study was to determine the level of theoretical knowledge and self-perceived comfort of medical students in Saudi Arabia in performing lifesaving CPR.

Materials and Methods

The present observational cross-sectional online questionnaire-based study targeted medical students in their third, fourth, fifth, and sixth academic years from the five principal regions (northern, eastern, central, southern, and western) of the Kingdom of Saudi Arabia. Participants for the study were selected using nonprobability convenience sampling. The sample was distributed equally among regions based on the proportional distribution of numbers of each region. Within the five regions, data collectors were recruited from each academic year to distribute the questionnaires. Specific tailored instructions were provided to each data collector to ensure proper distribution and representation. Each data collector was tasked with distributing the questionnaires in their respective academic year in their own region. Using the sample size calculator by Raosoft, Inc., the desired sample size was calculated to be 370, with a 95% confidence interval (CI), 5% margin of error, and a population proportion of 50%. The data collection process was started on the 1st of March 2022 and ended on the 1st of May 2022. Only the authors had access to

participants' responses, and frequent verification of the participants' responses was conducted.

The questionnaire elements were structured through the Google Forms platform and consisted of four sections. The first section provided a brief introduction to the study's aims and objectives, as well as informed consent to participate or withdraw from the study. The second section required the participants to input their demographic information, including age, gender, academic year, and BLS license status. The third section consisted of eight multiple-choice questions designed to evaluate participant's theoretical knowledge of BLS. The questions were carefully selected to cover the essential elements of BLS theoretical knowledge, such as the order of BLS steps, ventilation to compression ratio in an adult patient, and operating an automated external defibrillator, among others. The highest achievable score in the theoretical knowledge section was eight. The fourth section assessed self-perceived comfort in performing CPR on 1 to 5 (1 = very uncomfortable, 2 = uncomfortable, 3 = neutral, 4 = comfortable, and 5 = very uncomfortable) by asking the following question: "How comfortable will you be with your skills and willingness to perform an effective CPR if you encountered someone needs." To ensure content validity, the questionnaire was reviewed by experts in the fields of emergency medicine and cardiology. In addition, a preliminary pilot study was conducted on a small, selected group of medical students before data collection to ensure the clarity and face validity of the questions. Feedback on the clarity of the questions was gathered, and the questionnaire was edited accordingly.

The researchers entered all questionnaire-derived data in an Excel sheet and then transferred it to Statistical Package for Social Sciences software, version 21.0 (IBM Corp., Armonk, NY). Mean and SD were used to describe normally distributed variables, while median and interquartile range were used to describe skewed variables. The Shapiro-Wilk test was used to assess the normality of variables. The results were reported as means with 95% CIs. To estimate the association between theoretical BLS knowledge and self-perceived comfort in CPR performance, a Pearson's correlation test was conducted. Furthermore, Student's *t*-test and ANOVA were used to assess the theoretical BLS knowledge and self-perceived comfort in relation to gender, academic year, region, and BLS license status. A *p*-value <0.05 was considered as statistically significant. The study was conducted in accordance with STROPE guidelines.

Results

A total of 1,372 participants enrolled in the study, of which 745 (54.3%) were female and 627 (45.7%) were male. The mean age of the participants was 22.8 years (SD-1.69). Majority of the participants were not BLS license holders (771, 56.2%). Further details regarding participant demographics, region, and academic year of study are shown in Table 1.

The mean theoretical BLS knowledge score was 3.68 (95% CI: 3.57 to 3.80). Male students presented a higher score compared to females: 3.83 (95% CI: 3.65 to 4.00)

for males versus 3.56 (95% CI: 3.41 to 3.71) for female students. The relationship between BLS knowledge score and gender was found to be statistically significant ($p = 0.024$). Detailed distribution of the mean BLS knowledge scores in different regions and academic years on the basis of participant gender are presented in Figures 1 and 2, respectively. Senior medical students had the highest mean scores of 4.75 (95% CI: 4.53 to 4.98) and demonstrated significant differences in the mean BLS scores when compared to the other academic years ($p < 0.001$). Compared to other regions in the study, the eastern region had the highest mean score of 4.23 (95% CI: 4.01 to 4.46) with a significant p -value of <0.001 . The mean BLS knowledge scores for each academic year and region are shown in Table 2.

The mean of self-perceived comfort was 2.88 (95% CI 2.81 to 2.95). Male students reported a higher self-perceived comfort compared to females: 2.99 (95% CI 2.89 to 3.10) for males versus 2.79 (95% CI 2.96 to 2.88) for females. The relationship between the self-perceived comfort score and gender was statistically significant ($p = 0.004$). More details regarding genders' self-perceived comfort among their academic years and regions are presented in Figures 3 and 4, respectively. Senior medical students had the highest self-perceived comfort mean, 3.44 (95% CI 3.31 to 3.57), with a significant p -value ($p < 0.001$). The northern region had the highest self-perceived comfort mean, 3.14 (95% CI 2.98 to 3.30), with a significant p -value ($p < 0.001$). The self-perceived

comfort in each academic year and different regions is shown in Table 3.

Statistical analysis revealed a moderate correlation between self-perceived comfort and the theoretical knowledge of BLS ($r = 0.39$). BLS license holders had a higher theoretical knowledge score with a mean value of 4.40 (95% CI: 4.24 to 4.56) compared to nonholders who had a mean score of 3.12 (95% CI: 2.97 to 3.28) ($p < 0.001$). Similarly, BLS license holders reported a higher self-perceived comfort with a mean score of 3.34 (95% CI: 3.25 to 3.44) compared to nonholders who had a mean of 2.51 (95% CI: 2.42 to 2.61) ($p < 0.001$).

Discussion

This study aimed to assess BLS theoretical knowledge and self-perceived comfort of medical students regarding

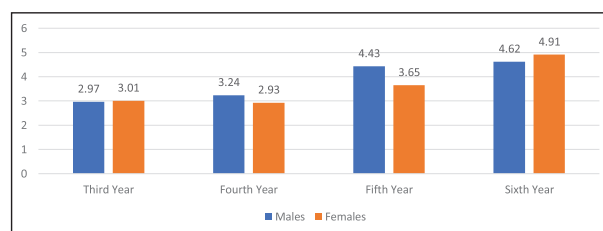


Figure 2. Mean BLS knowledge score among academic years.

Table 2. Distribution of BLS knowledge scores among medical students of different regions and academic years.

	Mean BLS knowledge score (95% CI)
Region	
Northern	3.73 (3.46, 4.00)
Southern	2.54 (2.29, 2.79)
Eastern	4.23 (4.01, 4.46)
Western	3.51 (3.27, 3.76)
Central	3.97 (3.72, 4.22)
Academic year	
Third	2.99 (2.78, 3.20)
Fourth	3.06 (2.85, 3.26)
Fifth	3.97 (3.73, 4.20)
Sixth	4.75 (4.53, 4.98)

Table 1. Participant demographics, academic years, and regions.

Characteristics	Results
Age (mean \pm SD)	22.80 \pm 1.69
Gender, n (%)	
Male	627 (45.7)
Female	745 (54.3)
Region, n (%)	
Northern	287 (20.9)
Southern	197 (14.4)
Eastern	310 (22.6)
Western	276 (20.1)
Central	302 (22.0)
Academic year, n (%)	
Third	356 (25.9)
Fourth	350 (25.5)
Fifth	313 (22.8)
Sixth	353 (25.7)
BLS license holder, n (%)	
Yes	601 (43.8)
No	771 (56.2)

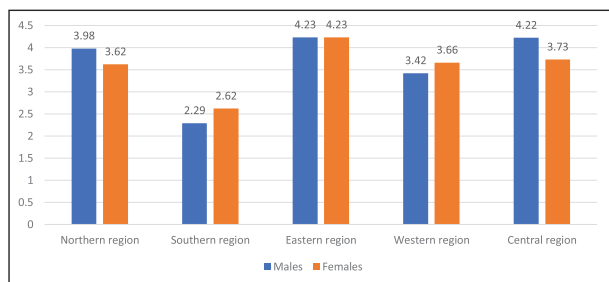


Figure 1. Mean BLS knowledge score among regions.

Table 3. Distribution of self-perceived comfort scores among medical students of different regions and academic years.

	Mean self-perceived comfort (95% CI)
Region	
Northern	3.14 (2.98, 3.30)
Southern	2.69 (2.50, 2.88)
Eastern	2.90 (2.76, 3.03)
Western	2.63 (2.48, 2.78)
Central	2.97 (2.81, 3.14)
Academic year	
Third	2.72 (2.57, 2.87)
Fourth	2.65 (2.52, 2.78)
Fifth	2.70 (2.56, 2.84)
Sixth	3.44 (3.31, 3.57)

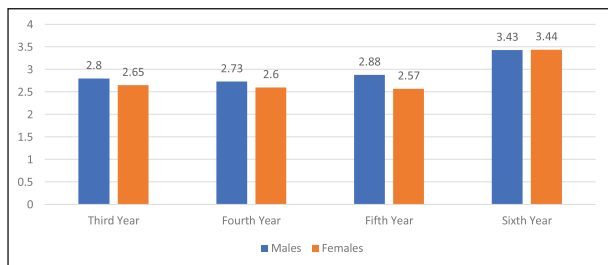


Figure 3. Self-perceived comfort among academic years.

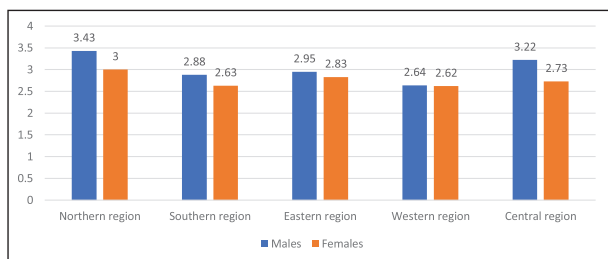


Figure 4. Self-perceived comfort among regions.

their willingness to perform CPR in Saudi Arabia. The results of this study mirrored the findings presented by previous studies highlighting low levels of BLS theoretical knowledge as well as self-perceived comfort in performing CPR among medical students. The mean BLS theoretical knowledge score obtained in this study was 3.68/8, which is considered poor as the mean is less than 50%. In a French study published in 2013, the mean theoretical score on advanced life support, which included BLS questions, was 20, bearing in mind that the score was calculated from 10 to 30. The authors in the French study highlighted that the mean score was low [11]. The essential components of BLS were covered in both studies, regardless of the differences in the questionnaires. Furthermore, the mean score of self-perceived comfort was 2.88, which means that most medical students in Saudi Arabia reported feeling uncomfortable with their willingness to perform CPR if they encountered an unexpected emergency situation. A similar result has been reported in a previous study conducted on French medical students [11]. This lack of confidence is an issue that must be addressed so that medical students can perform optimal-quality CPR when necessary. This thought was reinforced by a study conducted on teenage students, which showed that improving knowledge and comfort/confidence among students increased real-life CPR performance, as well as willingness and attitude toward performing CPR [12].

In this study, significant differences were found between the regions regarding BLS knowledge scores. The difference in scores might be due to different rules and regulations of the medical colleges pertaining to BLS licensing in the various regions of Saudi Arabia. Moreover, a significant association was found between participant gender and the theoretical knowledge of BLS and self-perceived comfort in performing CPR, with male students having higher scores than their female counterparts. This contrasts with the results reported by Khedher et al. [13], where higher BLS knowledge scores were found among

females; however, the association was not statistically significant. On the other hand, our results regarding gender-related comfort/confidence levels of performing CPR were similar to those of a previous French study [11]. Unsurprisingly, our study found that students with a BLS license had a higher BLS theoretical score and mean self-perceived comfort score. Similar results were found in a study examining the association between high scores and taking a BLS course [14]. Furthermore, a comparative study found that students who attended a formal BLS training program had better BLS knowledge compared to untrained students [15]. Moreover, the present study also revealed an association between the comfort of performing CPR and having a BLS license.

Limitations and Recommendations

This study has some limitations. In general, self-reported questionnaires are dependent on the subject's perception and lack objectivity. In this study, we assessed self-perceived comfort in performing CPR using a self-report questionnaire; however, the results may vary in real-life situations. Another limitation is that we assessed only the theoretical knowledge of BLS and not the practical BLS skills of participants. Moreover, there were no measures to prevent the participants from accessing the correct answers to the BLS theoretical questions in the questionnaire from other sources. Despite these limitations, the participants in this study were almost equally distributed between the different academic years and genders across the five different regions of the Kingdom, and thus, the results can be considered representative. The insights into the state of BLS training outcomes obtained through this study can help improve BLS knowledge and skills among medical students in Saudi Arabia. First, we recommend colleges to encourage students to acquire a BLS license before starting their clinical years, as it has implications for improving their knowledge and comfort of BLS techniques. Second, we recommend adding BLS training to their curriculum and providing simulation centers to better prepare future doctors for high-acuity situations. Third, we suggest adding a mandatory short rotation in the emergency department supported by continuous practice to achieve consistent BLS skills and knowledge.

Conclusion

BLS knowledge and comfort in applying CPR were found to be low and positively correlated among medical students in Saudi Arabia. Therefore, adding BLS training to the medical education curriculum and providing more simulation sessions with advanced models would be reasonable in order to obtain accurate feedback on the quality of a students' performance and improve their comfort with their willingness to perform effective CPR.

Acknowledgments

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List of Abbreviations

BLS Basic life support
CI Confidence interval

CPR Cardiopulmonary resuscitation
OHCA Out of hospital cardiac arrest

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this study.

Funding

None.

Consent to participate

Informed consent was provided to participants before filling out the survey as it is a cross-sectional study design.

Consent for publication

Not applicable.

Ethics approval

Ethical approval was granted by the Institutional Review Board at King Abdullah International Medical Research Centre (KAIMRC), Jeddah, Saudi Arabia, via reference number JED-22-427780-19651, date: 21 February 2022.

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