



Evaluation of Awareness, Knowledge, and Attitudes Towards Basic Life Support Among Non-Medical Students at Two Academic Institutions in Jeddah, Saudi Arabia

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Background: Cardiac arrests are a leading cause of mortality in Saudi Arabia. Prompt and quick intervention using early cardiopulmonary resuscitation (CPR) can be a life-saving strategy. Sufficient knowledge and awareness regarding CPR are important in initial care, particularly during an out-of-hospital cardiac arrest. We aim to assess the knowledge, awareness, and attitude toward CPR among the students of King Abdulaziz University and Jeddah University.

Materials and Methods: A descriptive, cross-sectional study design with a sample of 1053 non-medical students, regardless of their academic year, was conducted from May to July 2019 at both universities. Data were analyzed through chi-square and analysis of variance where a P-value <0.05 was considered statistically significant.

Results: Out of 1053 students, 28.7% received CPR training. Also, the majority of the subjects were female 71%. The science department provided the largest response. Results showed that chest pain was the most observed early sign of cardiac arrest among participants by a percentage of 84.6. Majority of the participants (90.9%) felt no hesitation in performing early CPR on a family member. Additionally, committing a mistake was the most feared factor that deterred students from performing CPR.

Conclusion: Knowledge and awareness of CPR among non-medical university students were poor, despite positive attitudes toward it. Integrating mandatory CPR courses in the orientation and in the first year of the undergraduate curriculum could increase awareness and improve the outcomes of out-of-hospital cardiac arrest (OHCA).

Keywords: basic life support, cardiopulmonary resuscitation, cardiopulmonary resuscitation training, out-of-hospital cardiac arrest, cardiac arrest

Introduction

Cardiopulmonary Resuscitation (CPR) is an emergency procedure that is used in cases of cardiac arrest, delaying CPR can increase mortality and morbidity rates.¹ This procedure comprises two major components: chest compressions and rescue breaths by means of artificial ventilation to maintain circulation and send oxygen to the organs.² Adequate knowledge and quality of CPR application can contribute to better outcomes in cases of cardiac arrest.² This is because the time between recognizing a cardiac arrest and the arrival of emergency medical services (EMS) can be lengthy up to 8 minutes in some districts.³ Despite

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major technological advancements such as automated external defibrillators (AEDs), striking disparities remain in survival rates between those experiencing in-hospital and out-of-hospital cardiac arrests (OHCAs).⁴

In the United States, OHCAs account more than 450,000 deaths annually.⁵ In Saudi Arabia, a prevalence of sudden cardiac arrests (SCAs) number was 7.76 out of 1000 hospital admissions at King Abdulaziz University hospital in 2016.⁶ We have no available data for OHCAs in Jeddah.

Public awareness of proper CPR application is crucial and a life-saving step that can be controlled.⁷ Nevertheless, people tend to make presumptions that CPR ought to be performed by certified medical personnel only.⁷ Accordingly, it is necessary to estimate the society on their knowledge, awareness, and attitude toward BLS so that appropriate interventions could be implemented much more readily than a medical expert who might not be available.⁷ Moreover, a university hospital in Oman found that patients who suffered sudden cardiac arrest were transported to the hospital by family or friends without even providing CPR.⁸ A study conducted in Vienna in 2018 found poor BLS and AED knowledge and awareness among individuals.⁹ In Oman, despite the variety in their socio-demographic characteristics, the level of knowledge towards BLS was quite low.¹⁰ In Riyadh, Saudi Arabia, a study appraising knowledge and attitude towards BLS among university personnel and students found that more than 50% of university personnel and students had inadequate information regarding BLS.¹¹ This lack of knowledge has contributed to an inability to perform CPR in many situations when it is sorely needed.¹² In government schools in Riyadh, 77% of the students expressed a need for BLS training and 78.5% supported mandatory BLS training.¹¹ Poor CPR knowledge and applications extend to university students; it was found that 87.9% of health students had very poor knowledge scores in BLS.¹¹

Studies assessing knowledge, attitude, and awareness toward BLS in the middle east, including Saudi Arabia are lacking. In our study, we intended to estimate the awareness, depth of knowledge, and attitude toward non-medical students. Non-medical students are more in quantity than medical, additionally lacking trusted sources accessibility that can lead to mistaken information regarding CPR, especially some colleges, did not obligate CPR practices in the studying courses.

Materials and Methods

We conducted a cross-sectional study at King Abdulaziz University and Jeddah University, both in Jeddah, Saudi

Arabia, from May to July 2019. We sought to estimate undergraduate students' knowledge, awareness, and attitudes towards BLS.

We used random sampling method. Out of 82,156 King Abdulaziz University students, we excluded 27,000 post-graduate students and medical field specializing in medicine, nursing, pharmacy, dentistry, or applied medical science as they receive mandatory BLS training. To end up with 55,156 students, a total of 1053 students participated in the study. We included undergraduate university students, at least 18 years old and able to read written Arabic language. The non-medical field includes different university departments such as Science, Engineering, Economics and Administration, Arts and Humanities, Computing and Information technology. Besides, to the preparation year.

We distributed the questionnaire via web address and sent it through university emails and social media for public advertisement. Informed consent was obtained before filling the questionnaire. All data were collected electronically.

This questionnaire was created using the Google Forms web application. The information of the questionnaire was derived from the American Heart Association and adhered to its latest guidelines.¹³ A translated validated Arabic and English version of the questionnaire provided by a study handled in Jordan¹⁰ (see the [supplementary material](#)).

The final self-administered questionnaire comprised seven demographic data questions (related to sex, age, university college year, grade point average [GPA], university name, studying specialty and relationship status), and 22 multiple-choice questions assessing knowledge about skills and attitudes towards BLS. We evaluate participants' knowledge on the following parameters: level of consciousness, respiratory signs, and cardiocirculatory evidence ([Table 1](#)). In addition to the clinical features of cardiac arrests, such as chest pain, breathing difficulties, cyanosis extra ([Table 2](#)). Also asked about the application of chest compressions (rate, location, depth and numbers related to artificial ventilation) ([Table 3](#)), and the correct use of the AED.

Data were analyzed using the software SPSS version 25. Descriptive statistical analysis was used for continuous data including numbers and percentages, also mean and standard deviation used for age. A chi-square test was used to determine if there were differences between those who received BLS training and those who did not in terms of cardiac arrest recognition, the action performed when witnessing a cardiac arrest, and the practical application of

CPR. There were no outliers to removed. Any p-value <0.05 was considered statistically significant.

Ethical approval was obtained from the Unit of Biomedical Ethics at King Abdulaziz University (Reference no. 315-19).

Results

Of the study population, 1053 students who completed the questionnaire. The majority were female (71.2%) with a mean age of 21 years (SD = 2.22). Among the participants, 28.6% were in their fourth year of undergraduate students and had a GPA greater than 3.5 out of 5 (87.1%). Detailed demographic information is presented in Table 4.

We found that 751 (71.3%) students had not received any CPR training. Where is 302 (28.7%) received CPR training, among those (10.7%) of the students underwent CPR training courses offered by the university, 64 (6.1%) students took it through school, 54 (5.1%) at specialized training centers, and (6.8%) took the CPR training from other places.

The results showed that 891 (84.6%) of students considered chest pain as a sign of cardiac arrest, 863 (82%) recognized circularity arrest (no palpable pulse), and 842 (80%) understood breathing difficulties as signs of cardiac arrest. The rest of the response rates for cardiac arrest signs are shown in Table 2.

There was no difference between students who had received formal BLS training and those who had not when selecting “no response to verbal stimuli” as a sign of recognizing a decreased level of consciousness; they were 136 (45%) and 265 (35.3%), respectively, with (p value= 0.00). Students who received BLS training were more likely to recognize respiratory signs of cardiac arrest than their peers (Table 1).

Regarding cardiac evaluation, the number of participants who had not received CPR training and could not accurately feel a pulse in the neck was higher than those who had received training 368 (34.9%) (Table 1).

Among participants, 200 (18.7%) of students had witnessed a cardiac arrest. The majority 94 (8.9%) called an ambulance, 32 (3%) provided both chest compressions and mouth-to-mouth ventilation, 20 (1.9%) asked someone to call for help, 19 (1.8%) provided chest compression solely, 14 (1.3%) watched and left, and 12 (1.1%) only offered mouth-to-mouth breathing. Students who received formal BLS training were more likely to perform chest compressions.

Table 1 Identification of Cardiac Arrest

Finding	Received CPR Training n (%)	Not Received CPR Training n (%)	Total Number n (%)	P value (Chi-Square)
Conscious evaluation				
No response when called	136 (12.9)	265 (25.2)	401 (38.1)	<0.001
No response when touched	86 (8.2)	140 (13.3)	226 (21.5)	<0.001
No movement	58 (5.5)	164 (15.6)	222 (21.1)	<0.001
I do not know	22 (2.1)	182 (17.3)	204 (19.4)	<0.001
Respiratory evaluation				
No respiratory movement	115 (10.9)	285 (27.1)	400 (38)	<0.001
No respiratory sound	41 (3.9)	98 (9.3)	139 (13.2)	<0.001
No air coming out from the mouth	83 (7.9)	175 (16.6)	258 (24.5)	<0.001
No steam coming up in front of the mouth of the victim	53 (5)	93 (8.8)	146 (13.9)	<0.001
I do not know	10 (0.9)	100 (9.5)	110 (3.3)	<0.001
Circulation evaluation				
Lack of circulation signs	62 (5.9)	129 (12.3)	191 (18.1)	0.028
Not feeling a pulse in the vessels of the neck	163 (15.5)	368 (34.9)	531 (50.4)	0.028
Not feeling a pulse in the vessels of the arm	77 (7.3)	254 (24.1)	331 (31.4)	0.028

Among participants, 326 (31%) responded that they had adequate knowledge to perform chest compression if they witnessed a sudden cardiac arrest. And, 348 (33%) could give both chest compression and ventilation, 330 (31.3%) could not act, and 228 (21.7%) would only provide chest compressions. Most participants answered

Table 2 Response Rates for Cardiac Arrest Signs

Signs	n (%)
Chest pain	891 (84.6)
Circulatory arrest	863 (82)
Breathing difficulties	842 (80)
Stop breathing	752 (71.4)
No movement	743 (70.6)
Unconsciousness	723 (68.7)
Cyanosis	619 (58.8)
Skin paleness	605 (57.6)
Nausea	303 (28.8)

correctly, even though they did not receive formal training regarding chest compression rates, determining adequate heart rate, and compression/ventilation ratio. Regarding the meaning of the chest compression, 136 (45%) of students who received CPR defined it as applying strong compression to the chest at specific intervals (Table 3).

When participants were asked, “To who would you provide CPR without hesitation?”, responses indicated that 957 (90.9%) would provide CPR on their friends, 840 (79.8%) would provide CPR to neighbour's, and 916 (87%) would resuscitate anyone.

When asked, “Would you perform CPR for a family member if you witnessed a cardiac arrest situation?”, more females (693, 65.8%) than males (264, 25.1%) answered “yes”. In comparison, 96 (9.1%) were hesitant to apply CPR protocol to a family members. When students were asked, “Why would you not perform CPR on a family

Table 3 Practical Application of CPR Between Those Who Received Training and Who Did Not

Item	Received Training n (%)	Did Not Receive Training n (%)	P value (Chi-Square)
Chest compression meaning	136 (45)	260 (34.6)	<0.001
Compression rate (100 compressions/minute)	76 (25.2)	109 (14.5)	<0.001
Compression location (middle of the chest)	251 (83.1)	564 (75.1)	0.003
Compression depth (5–6 cm)	176 (58.3)	431 (57.4)	0.339
Compression/ventilation ratio (30/2)	136 (45.0)	108 (14.4)	<0.001

Table 4 Demographic Characteristics of the Participants (N =1053)

Characteristics	Mean \pm SD/n (%)	
Age	21.36 \pm 2.2	
Sex	Female 750 (71.2%)	Male 303 (28.8)
Participants University	KAU 969 (92%)	Jeddah 84 (8)
Educational level	First year Second year Third year Fourth year Fifth year Sixth year	178 (16.9) 151 (14.3) 296 (28.1) 301 (28.6) 74 (7) 53 (5%)
GPA	>4.5 4.49–3.5 3.49–2.5 <2.5	385 (36.6) 532 (50.5) 126 (12) 10 (0.9)
Marital status	Single Married Divorced	987 (93.7) 58 (5.5) 8 (0.8)

member?” 70.2% were afraid of making a mistake, and 8.2% were concerned about the complications of CPR, such as rib fracture. Students were concerned about performing CPR on a stranger for fearing of committing a mistake (61.3%), followed by concerns about litigation (9.3%) and acquiring an infectious disease (7.5%).

The relationship between age and willingness to provide CPR was not significant ($p = 0.33$). Additionally, we examined the relationship between gender and willingness to perform CPR on a stranger. Females were more willing than males (Table 5).

Discussion

BLS courses are designed to deliver knowledge to a broad range of non-healthcare professionals regarding unpredictable and dangerous situations. A minority of non-medical students (28.7%) in our sample had formal BLS training courses. In King County, Washington state, USA, 79% of the community were reported to have received formal BLS training.¹⁴ In Poland,¹⁵ China,¹⁶ Australia,¹⁷ and Slovenia,¹⁸ those numbers were 75%, 74.4%, 64%, and 64%, respectively. We attribute this difference in the number of BLS-trained students in Saudi Arabia to the educational design and training courses of BLS and CPR in our

Table 5 Distribution of Attitude in Response to a Sudden Cardiac Arrest According to Gender

Responses	Female %	Male %	P value (Chi-Square)
Start with cardiac compression	21.9	20.8	0.017
Call 911	69.9	74.6	
Call someone for help	6.5	2	
Just watch and leave	1.7	2.6	

universities and communities. It has only recently acknowledged that public awareness of BLS application and CPR are very poor as the courses were only available to medical personnel. In contrast, in countries such as Turkey, Slovenia, and Japan, BLS courses are required to obtain a driver's license.

It was found a noticeable improvement of bystander CPR rates in Denmark from 19.4% in 2001 to 43.3% in 2010, and a decrease of the annual cardiac arrest cases to 34.4% per 100,000 people in 2010 lead to a remarkable increase in survival rates arriving at the hospital to 6.4% at 2010.¹⁹ In Saudi Arabia, out of 429 cases of OHCA, the rates of sudden cardiac arrest were only 3.5% between January and December in 2016 at University Hospital, Western Region, Saudi Arabia.⁶ A study obligated at a tertiary care hospital in Riyadh, between 1989 and 1995, showed survival rates of OHCA to hospital discharge was 5.1% for adults and 7.4% for children.²⁰ Furthermore, mortality rates of OHCA reached 95.8% with low rates of performing CPR by bystanders, according to a study published in 2015, King Khalid University Hospital, Riyadh, Saudi Arabia.²¹ Despite these outcomes, Saudi Arabia still needs more statistical researches about OHCA survival rate.

BLS training in schools is also highly relevant; American Heart Association guidelines recommend requiring CPR training program for graduation from secondary schools.²² A study established in Denmark targeted high school students to investigate the knowledge and fears of performing CPR before and after participation in 45-minute sessions of CPR training, a significant improvement of choosing the correct answers noticed and the prevalence of students who are willing to perform CPR increased from 30% to 90%.²³ At the College of Dentistry at King Saud University, third-year dental students had more profound knowledge than their older peers.²⁴ This difference might be because of a recent adjustment in the

university curriculum where CPR training has now been made an obligatory part of the medical specialty curriculum.

Universities were the primary source of BLS training and information, followed by schools and specialized training centers. This could explain the low knowledge levels in our community, particularly compared to China, where almost a quarter of middle school students learn CPR from television and books.¹⁶ Today, more CPR training center programs are open by medical organizations in Saudi Arabia, such as the Saudi Red Crescent Authority to the general population for free to improve the knowledge and competence of the public in the application of this life-saving skill.

Identifying the early signs of cardiac arrest can save critical time needed to save a victim's life. We found that 84.6% and 82% of the participants were able to identify chest pain and circulatory arrest, respectively, as early signs of cardiac arrest. Therefore, these should be given priority. The number of participants who could identify the signs of cardiac arrest was significantly higher among those who took CPR and BLS training. A study found that among the general Turkish population, only 38.6% were able to identify chest pain and 60.7% recognized circulatory discontinuation.⁷ These findings emphasize the educational variations between the general population and university students when recognizing cardiac arrest signs.

Previous research has been limited to identifying the relationships between gender, age, and willingness to perform CPR. Our sample chiefly consists of a young demographic with a mean age of 21 years. Similarly, in Vienna, Austria, researchers found that a younger age group was more willing to initiate CPR.⁹ This can be explained through the fact that BLS programs mostly target this age group for educational purposes.

Interestingly, the number of females who were willing to perform CPR was much higher than males in our study, which contrasts with the Vienna study.⁹ Moreover, despite Saudi Arabian culture being sensitive to mouth-to-mouth ventilation, especially between men and women, Saudi Arabian society has surmounted this barrier for the sake of intervening in an OHCA. This could be related to the higher emotional intelligence of women and may clarify why females were more impulsive and empathetic toward the victim.²⁵ Despite the high rate of willingness to perform CPR on a family member or a stranger, we were able to identify some limiting factors.

Participants were primarily concerned with making a harmful mistake. A minority of participants had second thoughts regarding litigation or infection transmission. A Jordanian study perceived a similar limitation.¹⁰ Apprehension concerning making a mistake is more likely related to not having enough experience in CPR and not associated with any particular technique teaching method.

Limitations

Our study had several limitations. First, it was only conducted in two government universities in Jeddah and did not involve private universities. Second, the self-administered questionnaire was designed specifically to be completed by a respondent without intervention of the researchers during data collection. Third, more accurate results could have been obtained by including an equal number of participants who had taken the BLS training compared to those who had not. Finally, our study might face the risk of selection bias as the students who are more interested and curious about BLS subject might be more willing to fill the questionnaire, and they may have lower or higher knowledge about the research topic than the rest of the population.

Besides, university students have a standard educational level, which does not necessarily represent the entire population with various academic levels.

Conclusion

Our study found that most of the non-medical students did not receive any BLS training. Overall, there was a low CPR knowledge and awareness level among university students in Saudi Arabia. Further studies with larger sample sizes are necessary to confirm further our findings, as well as cooperation between government and private universities. Our findings support the need for more formal teaching and training of each member in our society about BLS. To reach this goal, we must concentrate on educating the community's future leader university students; this can be achieved by integrating BLS courses and certification in the general university curriculum, regardless of the student's area of specialization. We recommend obligating BLS certification when obtaining or renewing a driver's license.

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Disclosure

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