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Original Article

## Knowledge of basic life support among the students of Jazan University, Saudi Arabia: Is it adequate to save a life?

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## ABSTRACT

**Background:** Basic Life Support [BLS; including cardiopulmonary resuscitation (CPR)] is a part of medical skills utilized in case of an emergency medical care to save human lives. It is well established that the young students can become major healthcare supportive workforce for a community including the cases of emergency. Therefore, adequate knowledge of BLS is necessary for all the university attending students. This study evaluated the awareness of BLS knowledge and attitude towards BLS training among the students of Jazan University, Saudi Arabia.

**Methods:** A self-administered survey questionnaire using cross-sectional design was employed.

**Results:** Out of 360 participants, the majority were male students (84.2%). The participants have mediocre knowledge of BLS, and their mean score was 7.83 out of 14. The knowledge score, i.e., correct response of male and female students was almost similar. Not a single student answered all the questions correctly. About 28% participants had received BLS training previously during their study course and showed better BLS knowledge (mean score 10.41) in comparison with the other participants. In contrast with the students of health science related courses, the highest mean knowledge score (11.5) was opted by the students of emergency medical services, whereas the lowest score (6.58) was opted by the students of nursing background.

**Conclusions:** Overall, a majority of the students of Jazan University did not have complete knowledge of BLS (CPR). The outcomes of this study will be helpful for education and healthcare service providers of the Saudi kingdom as a whole and for Jazan region.

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## 1. Introduction

Basic life support (BLS) is a set of emergency procedures applied to a patient, it comprises a number of techniques like cardiopulmonary resuscitation (CPR), shocking, and first aid treatments to sustain patient's life until advance medical facility arrives or the person reaches hospital. BLS including CPR is the initial step of prompt recognition and to provide emergency support of ventilation and circulation in case of respiratory or cardiac arrest.<sup>1</sup> It has a combination of skills including mouth-to-mouth breathing and chest compression to normalize blood circulation to the brain and vital organs. Earlier studies reported that immediate recognition of cardiac arrest, activation of the emergency medical services

(EMS) system, early cardiopulmonary resuscitation and defibrillation can make a difference between life and death.<sup>2</sup>

The timing of cardiopulmonary resuscitation is critical and of paramount importance as asphyxia triggers neuronal damage beyond two minutes of cardiac arrests.<sup>3</sup> Cardiovascular diseases cause 30% of global mortality amounting to 17 million deaths every year. In the developing countries, the mortality is double in numbers as that of the deaths caused by HIV, malaria and tuberculosis putting together. Cardiac conditions and ventricular tachyarrhythmia accounts for the majority of the deaths; approximately 40–50% of the deaths are caused by sudden cardiac arrest<sup>4</sup> as prognosis of out-of-hospital cardiac arrest is very poor (5–10%).<sup>5</sup> Timely application of an automated external defibrillator can double the rate of survival in out-of-hospital cardiac arrest victims,<sup>6</sup> as few early studies show that ventricular fibrillation is the main cause of sudden cardiac death in 59–60% of the cases.<sup>7,8</sup> In Saudi Arabia, cardiovascular diseases accounted for ~42% of all the deaths caused by

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non-communicable diseases in the year 1431H (2010).<sup>9</sup> It is estimated that by 2030, almost 23 million people will die from cardiovascular diseases in Saudi Arabia. Moreover, earlier report has revealed that up to 80% of all cardiac arrests occur at home.<sup>10</sup> The outcome and prognosis of cardiac arrest can be significantly improved post timely administration of cardiopulmonary resuscitation.<sup>11</sup> Despite the fact that extremely basic knowledge and skill set is required to defibrillate a victim or to use the automated external defibrillator,<sup>12</sup> an early study reports that only 9.1% victims of cardiac arrest received some CPR help in Riyadh, the capital city of Saudi Arabia.<sup>13</sup> Another study revealed that 74% of the cardiac arrest cases occurred at home, and only 17% non-traumatic and 3% traumatic cases received immediate CPR. Notwithstanding multiple research findings strongly suggested that CPR training, availability of the AED (automated external defibrillators) and early defibrillation have significant outcome in out of hospital cardiac arrest cases, but no actual estimates are available about the real status of BLS knowledge among the general public. Nevertheless, several studies have analyzed the awareness of BLS knowledge among the university students<sup>14–16</sup> and various communities in the different countries<sup>17–19</sup> of the world including Saudi Arabia.<sup>16,20–22</sup>

BLS involves nothing as far as resources are concerned and its importance and significance is undeniable. Adequate knowledge and suitable awareness of the techniques and practices enable a person to effectively resuscitate a victim and can save a human life. Ideally everyone should be aware of BLS and must be practically trained. The awareness and knowledge of BLS among Saudi population is of prime importance and have been tested earlier in a variety of sub-populations in Saudi Arabia.<sup>16,20–22</sup> Despite many pertinent reports from the kingdom that evaluated the university students' awareness about BLS, still no data have been reported regarding the awareness of BLS among the graduate student of Jazan University. Even, no relevant data is available evaluating the knowledge of BLS among the population/residents of Jazan province. Keeping aforesaid facts in view, the present study was undertaken among the students of Jazan University, Saudi Arabia, to assess their awareness and knowledge of BLS and examine their attitude towards BLS (CPR) training.

## 2. Materials and methods

### 2.1. Participants and study design

Across-sectional questionnaire based survey study (quantitative and observational) was conducted employing self-administered questionnaire at the different colleges/departments of Jazan University, Saudi Arabia. The participants were undergraduate male and female students enrolled at different colleges/departments of Jazan University. The participants were informed in advance about the objective of the study. The participation of the subjects was entirely voluntary and their identities were kept anonymous.

### 2.2. Data collection methods

A self-administered and bilingual questionnaire (Arabic and English) was developed. The questionnaire included 14 different items adapted by following the American Heart Association's BLS manual. The questionnaire was piloted on 10 participants and modified as per the need and further validated by the emergency medical services (EMS) department ([Appendix A: Survey Questionnaire](#)). The survey questionnaire was divided in two sections. The first section involved the questions about the demographic details of the participants. While, the second section pertained to the

questions covering the different aspects of the BLS including the history of the CPR training to evaluate the actual knowledge retention by the participants. Few questions covered trauma management cases as the road traffic accidents and injuries are one of the leading causes of death in Saudi Arabia, especially in Jazan region. Each question of the survey followed by four choice options in which one answer was correct/best. The correct response of individual items was collected to obtain a total score.

### 2.3. Statistical analysis

The data collected were tabulated in MS Excel sheet, and analyzed by using SPSS software program (SPSS Inc., Chicago, IL, USA, version 20 software). The participants were divided in two groups based on the departments under study. Group A (where BLS course is covered in their curriculum), included the departments of medicine, nursing, pharmacy and emergency medical services. Whereas, Group B (where BLS course is not a part of curriculum) included the departments of engineering, business administration, arts and preparatory year. Pearson's chi-square test was used to evaluate and quantify the associations between the categorical outcomes. The statistical significance level was maintained as  $p$ -value  $< 0.05$  during the entire analysis.

### 2.4. Ethical consideration

The study was approved by the Research Ethical Committee of the College of Nursing and Allied Health Sciences, Jazan University, Saudi Arabia. In addition, the methods employed in this study were carried out in accordance with the approved guidelines of the college.

## 3. Results

A total of 360 participants completed the questionnaire, of them 303 (84.2%) were males and 57 (15.8%) were females. The result showed, not a single student answered all the questions correctly. About 19.4% students reported that they have received BLS training previously. The participants mean (standard deviation = SD) scores and their enrollment in different courses of the study is listed in [Table 1](#). The overall mean score of male and female students was nearly equal. However, the scoring rate of male and female students has shown significant difference for 8 items, out of 14 items as shown in [Table 2](#). The majority of the female student had knowledge about the spinal immobilization in trauma patients (94.7%), recognition of cardiopulmonary resuscitation (82.5%), and the steps of the cardiopulmonary resuscitation (47.4%), as compared to the male students ([Table 2](#)).

The knowledge of BLS was highest among the students of Baish Community College (mean score = 12.53), followed by the students of Department of EMS (mean score = 11.5) and the College of Medicine (mean score = 10.8) (incl. all streams). However, the Department/College of Respiratory Care, College of Applied Medical Sciences, and Art and Literature scored lowest regarding the awareness of BLS training ([Table 1](#)).

In comparison to the Group B comprising colleges' students, the majority Group A colleges' students had better knowledge of recognition of cardiopulmonary resuscitation (60.6% vs. 80%;  $p = 0.01$ ), ventilation process (41.3% vs. 68.3%,  $p = 0.001$ ) and awareness about the location of chest compression (47.1% vs. 68.3%,  $p = 0.009$ ) ([Table 3](#)). The participants from Group B colleges were found to be less aware of procedural information like the rate of chest compression, depth, and correct ratio of ventilation to compression ([Table 3](#)). Of the total students, only ~74.4% students were aware about the emergency number and ~62.5% student

**Table 1**  
Mean of the correct responses attempted by the students of various colleges/departments of Jazan University, against each question of BLS knowledge.

| Categories                          | Participants<br>n (%) | Mean (SD)    | Minimum | Maximum | ANOVA (p) <sup>a</sup> |
|-------------------------------------|-----------------------|--------------|---------|---------|------------------------|
| <i>Gender</i>                       |                       |              |         |         |                        |
| Male                                | 303 (84.2)            | 7.83 (3.18)  | 0       | 13      | 0.016                  |
| Female                              | 57 (15.8)             | 7.84 (2.49)  | 4       | 12      |                        |
| <i>Colleges of Jazan University</i> |                       |              |         |         |                        |
| Pharmacy                            | 13 (3.6)              | 9.92 (3.43)  | 2       | 13      | 0.0001                 |
| Emergency Medical Services          | 10 (2.8)              | 11.50 (2.42) | 5       | 13      |                        |
| Applied Medical Sciences            | 19 (5.3)              | 6.11 (3.67)  | 1       | 13      |                        |
| Medicine                            | 15 (4.2)              | 10.80 (1.61) | 7       | 12      |                        |
| Public Health & Tropical Medicine   | 8 (2.2)               | 6.88 (3.36)  | 2       | 13      |                        |
| Baish Community College             | 15 (4.2)              | 12.53 (1.06) | 10      | 13      |                        |
| Dentistry                           | 4 (1.1)               | 8.50 (3.51)  | 5       | 12      |                        |
| Education                           | 17 (4.7)              | 7.29 (2.26)  | 3       | 10      |                        |
| Business Administration             | 15 (4.2)              | 9.73 (1.71)  | 7       | 12      |                        |
| Art and Literature                  | 19 (5.3)              | 6.53 (2.22)  | 2       | 10      |                        |
| Preparatory                         | 4 (1.1)               | 7.75 (2.06)  | 5       | 10      |                        |
| Computer science                    | 38 (10.6)             | 7.37 (3.16)  | 0       | 12      |                        |
| Engineering                         | 49 (13.6)             | 8.04 (2.50)  | 2       | 13      |                        |
| Science                             | 27 (7.5)              | 5.78 (2.65)  | 2       | 13      |                        |
| Nursing                             | 24 (6.7)              | 6.58 (2.08)  | 4       | 11      |                        |
| Respiratory Therapy (Female)        | 33 (9.2)              | 8.76 (2.39)  | 4       | 12      |                        |
| Respiratory Therapy (Male)          | 24 (6.7)              | 5.54 (2.30)  | 1       | 11      |                        |
| Miscellaneous Colleges              | 26 (7.2)              | 7.08 (2.70)  | 1       | 13      |                        |
| <i>Previous CPR Training</i>        |                       |              |         |         |                        |
| Yes                                 | 70 (19.4)             | 10.41 (2.29) | 4       | 13      | 0.0001                 |
| No                                  | 188 (52.3)            | 7.36 (2.87)  | 1       | 13      |                        |
| Not Answered                        | 102 (28.3)            | 6.92 (3.00)  | 0       | 13      |                        |
| Total                               | 360 (100)             | 7.83 (3.08)  | 0       | 13      |                        |

Note: CPR-Cardiopulmonary resuscitation.

<sup>a</sup> The variation score in different categories was analyzed by ANOVA test using p-value  $\leq 0.05$  as a level of significance.

**Table 2**  
Analysis of correct responses of BLS knowledge, awareness, and attitude based on questionnaire from male and female students (n = 360).

| Items | Total (%)  | Male n (%) | Female n (%) | $\chi^2$ | p-value <sup>a</sup> |
|-------|------------|------------|--------------|----------|----------------------|
| 1     | 268 (74.4) | 238 (78.5) | 30 (52.6)    | 16.94    | 0.001                |
| 2     | 225 (62.5) | 178 (58.7) | 47 (82.5)    | 11.51    | 0.001                |
| 3     | 298 (82.8) | 244 (80.5) | 54 (94.7)    | 6.79     | 0.009                |
| 4     | 101 (28.1) | 95 (31.4)  | 6 (10.5)     | 10.31    | 0.001                |
| 5     | 219 (60.8) | 188 (62.0) | 31 (54.4)    | 1.18     | 0.277                |
| 6     | 178 (49.4) | 143 (47.2) | 35 (61.4)    | 3.87     | 0.049                |
| 7     | 189 (52.5) | 158 (52.1) | 31 (54.4)    | 0.097    | 0.756                |
| 8     | 228 (63.3) | 187 (61.7) | 41 (71.9)    | 2.15     | 0.142                |
| 9     | 93 (25.8)  | 66 (21.8)  | 27 (47.4)    | 16.39    | 0.001                |
| 10    | 208 (57.8) | 173 (57.1) | 35 (61.4)    | 0.36     | 0.546                |
| 11    | 168 (46.7) | 164 (54.1) | 4 (7.0)      | 42.78    | 0.001                |
| 12    | 216 (60.0) | 187 (61.7) | 29 (50.9)    | 2.35     | 0.125                |
| 13    | 204 (56.7) | 171 (56.4) | 33 (57.9)    | 0.042    | 0.838                |
| 14    | 223 (61.9) | 179 (59.1) | 44 (77.2)    | 6.68     | 0.010                |

<sup>a</sup> Chi-square test ( $\chi^2$ ) was used for the statistical analysis and p-value  $\leq 0.05$  was considered as significant.

were able to identify the cardiopulmonary resuscitation cases (Fig. 1).

#### 4. Discussion

Motor vehicle accidents are the principal cause of mortality in adolescents and young adults worldwide.<sup>23</sup> About three-quarters of road deaths occur in developing countries, and mainly men are involved in 80% (a mean value) of casualties. In Saudi Arabia, the motor vehicle is the main means of transportation with 1 person killed and 4 injured on hourly basis.<sup>23</sup> A report says road traffic accidents are the major health hazard in Saudi Arabia, especially during Ramadan; and Jazan region of the kingdom is not an exception regarding the trauma cases due to road accidents. Earlier study reported that the ensuing trauma has increased in direct proportion to the increase in the number of road vehicles.<sup>24</sup> Hence,

strategic prevention plans should be implemented at the earliest by all the relevant sectors for e.g., health, police, transport, and education, to decrease the mortality. In all the trauma cases, BLS (CPR) support is needed and this pre-hospital care help can save human life. Keeping this fact in view, the present study was aimed to assess Jazan University students' awareness and attitude of BLS (CPR).

The awareness of BLS and practice of CPR technique ensures the survival of the patient long enough till experienced medical help arrives and in most of the cases is itself sufficient for the patient survival. Cardiac arrests and accidents leave the victims with severe fatal morbidities if not treated promptly.<sup>16</sup> Early identification and intervention of cardiac arrest victims by performing CPR forms the cornerstone of BLS, which helps in sustaining the patient's life until medical care arrives and the patient is transferred to hospital settings for further advanced management.<sup>25</sup> Survival chances

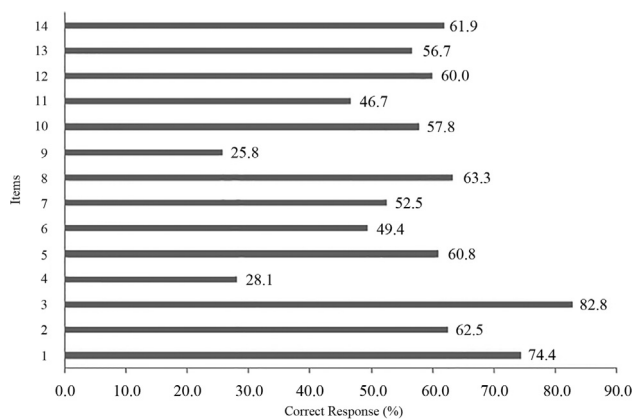
**Table 3**  
Comparative table of responses regarding the knowledge of BLS(CPR) between the participants of Group A [BLS(CPR) related course is a part of their curriculum] vs. Group B [BLS (CPR) related course is not a part of their curriculum].

| Items  | Correct Response     |                       | $\chi^2$ | p-value |
|--|----------------------|-----------------------|----------|---------|
|  | Group A <sup>*</sup> | Group B <sup>**</sup> |          |         |
|  | (N = 60)             | (N = 104)             |          |         |
|  | n (%)                | n (%)                 |          |         |
| What is the emergency medical service dial number?   | 47 (78.3)            | 89 (85.6)             | 1.41     | 0.235   |
| What will be the next step if you find a patient, who is unresponsive?   | 48 (80.0)            | 63 (60.6)             | 6.56     | 0.010   |
| Is it necessary to take spinal movement precautions in unconscious trauma patients?  | 56 (93.3)            | 95 (91.3)             | 0.21     | 0.650   |
| How to open the airway in trauma or injured patients?  | 18 (30.0)            | 21 (20.2)             | 2.02     | 0.155   |
| If a person is unconscious having weak pulse but he is not breathing, what shall we do?  | 39 (65.0)            | 69 (66.3)             | 0.031    | 0.861   |
| How many persons can help in resuscitation of a patient who is unresponsive if the person doesn't know mouth to mouth ventilation or there is any limitation to mouth to mouth ventilations? | 41 (68.3)            | 43 (41.3)             | 11.09    | 0.001   |
| If we need to do the chest compression for resuscitating an unconscious patient, what will be the location for chest compressions?   | 41 (68.3)            | 49 (47.1)             | 6.92     | 0.009   |
| While doing resuscitation what will be the ratio of chest compression and ventilation in adults and children?  | 38 (63.3)            | 66 (63.5)             | 0.0001   | 0.987   |

# Chi-square test ( $\chi^2$ ) was used for the statistical analysis and p-value  $\leq 0.05$  was considered as significant.

\* Group A colleges have BLS/CPR and first-aid course as an essential part of their curriculum.

\*\* Group B colleges don't have any BLS/CPR related course(s) in their curriculum.



**Fig. 1.** The percentage distribution of the students based on their correct responses on all the items of the survey questionnaire used in this study.

decrease by 7–10% for every minute, if CPR is delayed.<sup>17</sup> Resuscitation “is the act of restoring life or consciousness of one apparently dead”.<sup>18</sup> Good prognosis and event free survival post cardiac arrest is highly dependent on the availability of prompt defibrillation and BLS.<sup>26</sup> Most victims of cardiac arrest don't receive adequate resuscitation within the critical time that reduces the chance of survival. So, it is very important that every person in the community must know about BLS and CPR to save lives.<sup>19</sup>

The available knowledge and skills with a positive attitude towards BLS can make a significant difference in Saudi Arabia, where 42% of all non-communicable disease deaths are caused by cardiovascular disorders.<sup>9</sup> Out of 360 students surveyed, only 20% had recent BLS training. We found that 74.4% male students and 52.6% female students know the correct telephone number to contact the emergency response systems, which may be a result of the public education drive conducted by the Saudi Red Crescent authority. The emergency numbers written on the ambulances and other prominent places like billboards seems to have the desired effects. About 82.8% male students and 94.7% female students realize the need of spinal immobilization in case of an accident, the absence of which may lead to lifelong spinal impairment and disability. Only 1/3rd of the male students and 1/10th of the female

students knew the correct method of airway opening in trauma patients. Better awareness was present about the correct management of respiratory arrest case among the responders with more than half having knowledge about it in both the groups. Overall, only 49% of the students were aware about hands only CPR, which underlines the need to educate them about its benefit. Only 52% of the students were aware about the correct location of the chest compressions for performing cardiopulmonary resuscitation. This shows that the overall knowledge of BLS/CPR training among Jazan University students is not sufficiently enough and need major improvements in order to save lives in the near future. Hence, based upon the current findings, a mandatory introductory course of BLS/CPR including first-aid must be introduced for the preparatory year students along with a short course (8–10 weeks) of BLS/CPR hands on training with practical demonstrations for acquiring practical knowledge for the final year university students of Saudi Arabia is recommended irrespective of their departments/colleges/streams.

Based upon the results derived from this study, we can also recommend the dissemination of video tutorials for hands only CPR and BLS techniques using social media platforms, which might prove useful. Introduction of first aid and CPR as a mandatory subject for all non-medical and medical faculties is also under consideration from the government.

Despite the important findings resulted from this study, it is vital to mention the limitation(s) of the present study. First, this was conducted with a questionnaire-based survey only, so failed to appraise the psychomotor practical skills related to BLS/CPR among the students, which might slightly influence the current results. Second, comparative numbers of participants from both the genders were not recruited, hence gender bias is present, but it won't affect much, as the objective of the study was different. Third, small sample size, which further warrants for future studies with larger sample involving more contributory factors.

Although, many similar cross-sectional studies have been conducted in the past in various populations especially among university students from different countries<sup>16,19,27,28</sup> including Saudi Arabia<sup>16,20–22</sup> regarding the awareness/knowledge of BLS/CPR, but, the data of awareness of BLS/CPR of Jazan University students is unique. The present study is important due to its scope and application in designing future plans and educational strategies

to prepare Jazan University students for BLS/CPR training and their future help in Saudi community, especially in Jazan province. The importance of the present study will be more highlighted in view of vulnerability of high road trauma accident cases in the province, and the university students are majorly the new road-on-drivers as well as affected in the road accidents, hence awareness of BLS/CPR can improve the current situation.

## 5. Conclusion

In conclusion, the outcome and prognosis of cardiac arrest can be significantly improved by the timely administration of BLS/CPR. BLS/CPR is an important part of first-aid training. The present study revealed the understanding and familiarity of BLS/CPR and attitude towards BLS training of the students of Jazan University, Saudi Arabia. The results indicate that the overall knowledge of BLS/CPR training among Jazan University students is not adequate and need significant improvements in order to save lives. Hence, our findings endorse the recommendation of preliminary courses based on first-aid and BLS/CPR training for all the university students irrespective of their stream of study or specialization.

## Conflict of interest

The authors declared that there is no conflict of interest.

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## Conflict of interest

The authors declare that they have no conflict of interest.

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## Appendix A. Survey questionnaire

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.conbuildmat.2018.05.272>.

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