

Junior Savior: The Impact of Basic Life Support Program Instruction on Student's Knowledge and Confidence in Riyadh Schools

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ABSTRACT

Sudden cardiac arrest in school environments is preventable when trained lay responders act promptly, but information from Saudi Arabia schools remains scarce. Our study which conducted by Heart Health Center at King Saud Medical City affiliated with Riyadh First Cluster aims to investigation assess whether a brief instruction of Basic Life Support (BLS) intervention can raise essential competencies among school communities. A pre-post observational design was used in several randomly selected primary education schools in Riyadh in 2025. Primary education school students and teachers who attended a 90-minute basic life support session were eligible. The class followed the 2020 American Heart Association recommendations and blended video instruction, live demonstration, and manikin practice supervised by certified instructors. The questionnaire recorded familiarity with BLS, recognition of cardiac arrest symptoms, knowledge of the circulation, airway, breathing sequence, perceived ability to respond, and confidence immediately before and after training. A total of 212 participants completed both assessments. Recognition of emergency symptoms improved from 79 participants (41.1%) pre-training 212 (100.0%) following the course. Correct identification of the BLS sequence increased from just 30 participants (14.5%) to 212 (100.0%) following the course. Regarding perceived improvement, only 77 participants (36.5%) initially reported significant improvement, compared to 212 (100.0%) after training. Confidence also improved markedly, before training, only 49 participants (23.6%) felt very confident, while after the course, all 212 participants (100.0%) reported very high confidence. A statistically significant improvement in participants' knowledge and perceived training effectiveness was observed after the BLS course. The mean knowledge score increased from 1.28 before training to 4.00 after training ($p = 0.001$). Similarly, the mean training effectiveness score rose from 4.63 to 600 ($p=0.001$). Following the BLS training, 174 participants (96.1%) were able to perform chest compressions correctly, and 167 (88.8%) correctly identified the compression-to-breathing ratio. Only 13 participants (9.0%) practiced using an AED. While most participants (82.7%) reported no difficulty understanding the training method, the same percentage (82.7%) found the training facilities adequate for hands-on practice. A strong majority (189, 93.6%) supported making BLS training mandatory in schools. A ninety-minute classroom based BLS program produced substantial improvements in knowledge and self-efficacy among students and staff. Integrating such training into routine school schedules may strengthen community first responder capacity.

Keywords: Basic Life Support; Confidence; Knowledge; Saudi Arabia; Students.

INTRODUCTION

Basic Life Support (BLS) is an emergency procedure that aim to manage the injuries immediately before clinical treatment begins¹. BLS care is given to patients who complain from several conditions including respiratory failure, airway blockage, and cardiac events². In addition to that, BLS performed by certain processes such as cardiopulmonary resuscitation (CPR) and defibrillation³. The techniques which are used in BLS help in increasing the survival rate, reduce life threatening conditions, protect organs against dysfunction, and improve the quality of life⁴. Moreover, every year 60-80% of people died due to heart events and because of that CPR technique is important in supporting the process of blood and oxygen flow into the vital organs to keep them healthier^{5,6}.

On the other hand, defibrillation is restoring the heart functions by returning its rhythm into the normal state in case of arrhythmia thus enhance heart ability to perform its functions appropriately⁷. BLS training is important and crucial, it includes provide the patient with appropriate first aids immediately to keep his life. Also, the BLS

providers must have high knowledge to differentiate between the medical conditions particularly those related to heart and respiratory systems⁸. In BLS, the provider will deal with emergent cases and because of that he must know about CRP and defibrillation and how to manage with such like these situations to improve the patient outcomes and quality of life^{9,10}.

Many studies conducted in different countries confirmed that increasing the knowledge related to BLS was associated with reducing the mortality rates and had several positive outcomes on the patients¹¹. In Saudi Arabia, Al Enizi et al. conducted a study on BLS providers, and they found that their knowledge according to this topic is too limited and need for more education¹². Similarly, in Saudi Arabia, many studies also showed that the awareness of BLS among school students was very poor which highlighted the importance of increasing the attention to this field¹³⁻¹⁵. This is the first study to examine the impact of BLS training among primary school students in Saudi Arabia. This study aims to explore and evaluate the impact of BLS training on school students in Riyadh.

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METHODOLOGY

Study design: This study applied a pre-post observational design in four Riyadh public schools between May and July 2025, aiming to evaluate whether a single structured BLS session could improve knowledge and skills among school communities. School directors first identified suitable classes, then the research team scheduled on-site visits during regular activity hours. All data were collected inside school premises to minimise travel burden and ensure a familiar environment for participants.

Study population: Eligible participants were students as well as any teacher, administrator or support staff member who wished to attend. Of 220 individuals invited, 212 completed both baseline and immediate post-training questionnaires, giving a response rate of 96 %. Written consent was obtained from each adult; for minors, parental consent and student assent were secured the day before the session.

BLS intervention: The intervention consisted of a 90-minute class aligned with the 2020 American Heart Association guidelines. A certified instructor used a ten-minute video, a concise slide deck and live demonstration to explain scene safety, compression-only cardiopulmonary resuscitation, rescue breaths and automated external defibrillator use. Participants then rotated through hands-on stations equipped with adult manikins and training AEDs, Figure 1; the instructor-to-learner ratio did not exceed one to six, allowing individual feedback. All equipment was supplied by the Heart Center and calibrated on the morning of each visit.



Figure 1. Instructors demonstration session

The study instrument: A questionnaire developed by the research team captured data at two points including immediately before instruction (baseline) and directly after practical stations (post-test). Section 1 documented age, gender, school role and prior BLS exposure. Section 2 assessed baseline familiarity, symptom recognition and knowledge of the recommended circulation-airway-breathing sequence. Section 3 evaluated perceived training effectiveness, confidence and facility adequacy, together with one open-ended item on the most useful component. Each closed item employed either dichotomous or four-level ordinal response options; higher scores indicated greater competence.

Knowledge score was calculated based on participants' responses to items such as familiarity with BLS (scored 0-2), symptom recognition (0-1), and identification of the correct BLS sequence (0-1), both before and after the lecture. Then summed to generate a total knowledge score ranged from zero to four. Training effectiveness was assessed through participants' perceived improvement and confidence, using a Likert-

scale, with higher scores reflecting greater effectiveness. After the training, additional components were included to assess practical skills and retention (e.g., ability to perform correct compressions, identify compression-to-breathing ratio, and use of AED), and implementation challenges (e.g., difficulty understanding the method and adequacy of facilities), then summed to generate a total effectiveness score ranged from zero to six. Post-training items assessed practical skills (e.g., compressions and AED use), implementation challenges and feedback, recorded as frequencies and percentages.

Ethical approval: Ethical approval was granted by the institutional review board of the Heart Center (reference HC-BLS-01-25). Participation was voluntary, and the questionnaire omitted personal identifiers.

Data analysis: Data were analyzed using descriptive and inferential statistical analysis. Frequencies and percentages were used to summarize participants sociodemographic characteristics, and items related to the knowledge and effectiveness of the training course. The knowledge and effectiveness score were reported as mean ± standard deviation (SD). The scores were calculated before and after the training. A paired sample t test was applied to assess the difference in the scores among the participants. All statistical analyses were two tailed, conducted at a significance level of $p < 0.05$ and performed using Statistical Package for Social Science (SPSS), version 31.

RESULTS

A total of 210 participants were enrolled in the BLS training program conducted for school students. The majority were below 12 years old ($n = 103$, 53.1%), followed by participants aged 12-18 years ($n = 86$, 44.3%). Most participants were females ($n = 159$, 76.1%). Regarding prior experience, only 60 participants (31.7%) had received previous BLS or similar training. Table 1 presents the demographic characteristics of participants in the BLS training program.

Table 1. Demographic characteristics of participants in the Basic Life support training program

Demographic characteristics	N	%
Age	Below 12 years old	103 53.1%
	12-18 years old	86 44.3%
	> 18	5 2.6%
Gender	Male	50 23.9%
	Female	159 76.1%
Role	Student	201 95.7%
	Teachers, administration, others	9 4.3%
Previous training	Yes	60 31.7%
	No	129 68.3%

Before the BLS training, only 24 participants (11.3%) reported being very familiar with BLS, while 86 (40.6%) were not familiar at all. After the training, all 212 participants (100.0%) reported being very familiar. Recognition of emergency symptoms improved from 79 participants (41.1%) pre-training 212 (100.0%) following the course. Correct identification of the BLS sequence increased from just 30 participants (14.5%) to 212 (100.0%) following the course. Regarding perceived improvement, only 77 participants (36.5%) initially reported significant improvement, compared to 212 (100.0%) after training. Confidence also improved markedly, before training, only 49 participants (23.6%) felt very confident, while after the course, all 212 participants (100.0%) reported very high confidence, Table 2.

Table 2. Impact of Basic Life Support training on knowledge, skills, and confidence levels.

		Before training		After training	
		N	%	N	%
Familiarity with BLS	Not familiar	86	40.6%	0	0.0%
	Somewhat familiar	102	48.1%	0	0.0%
	Very familiar	24	11.3%	212	100.0%
Symptom recognition	Yes	79	41.1%	212	100.0%
	No	113	58.9%	0	0.0%
Correct bls sequence identification	Yes	30	14.5%	212	100.0%
	No	177	85.5%	0	0.0%
Improved ability	Not	3	1.4%	0	0.0%
	Slightly	65	30.8%	0	0.0%
	Moderately	66	31.3%	0	0.0%
	Significant	77	36.5%	212	100.0%
Confidence	Not	9	4.3%	0	0.0%
	Slightly	78	37.5%	0	0.0%
	Confident	72	34.6%	0	0.0%
	Very	49	23.6%	212	100.0%

The results demonstrated a statistically significant improvement in participants' knowledge and perceived training effectiveness after the BLS course. The mean knowledge score increased from 1.28 before training to 4.00 after training ($p = 0.001$), Figure 2.

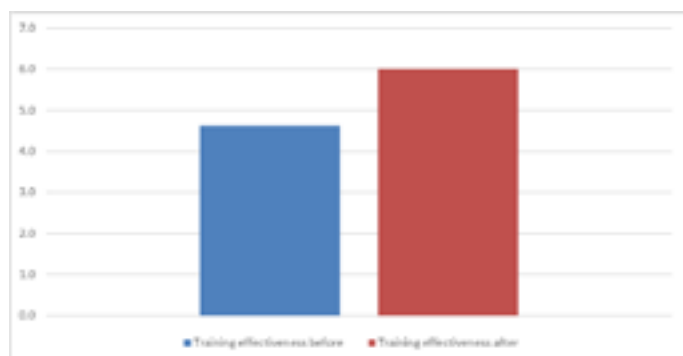


Figure 2. Training effectiveness comparing before BLS training and after.

Similarly, the mean training effectiveness score rose from 4.63 to 600 ($p=0.001$) (Table 3 and Figure 3).

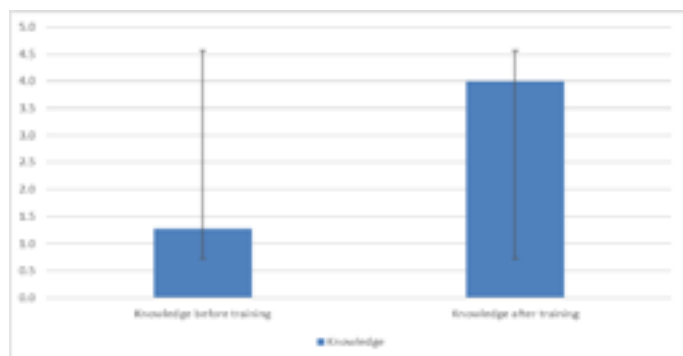


Figure 3. Knowledge score before and after the training.

Table 3. Effect of BLS training on knowledge and perceived training effectiveness

Knowledge and training score	Mean	Standard deviation	P-value
Knowledge before training	1.28	1.09	0.001
Knowledge after training	4.00	0.00	
Training effectiveness before	4.63	1.66	0.001
Training effectiveness after	6.00	0.00	

Following the BLS training, 174 participants (96.1%) were able to perform chest compressions correctly, and 167 (88.8%) correctly identified the compression-to-breathing ratio. However, only 13 participants (9.0%) practiced using an AED. While most participants (82.7%) reported no difficulty understanding the training method, the same percentage (82.7%) found the training facilities adequate for hands-on practice. Notably, a strong majority (189, 93.6%) supported making BLS training mandatory in schools, Table 4.

Table 4. Participants' performance feedback following BLS training

Performance feedback		N	%
Perform correct compressions	Yes	174	96.1%
	No	7	3.9%
Identified correct compression-to-breathing ratio	Yes	167	88.8%
	No	21	11.2%
Practiced using AED	Yes	13	9.0%
	No	131	91.0%
Difficulty understanding training method	Yes	35	17.3%
	No	167	82.7%
Training facilities adequate for hands on practice	Yes	167	82.7%
	No	35	17.3%
BLS mandatory for schools	Yes	189	93.6%
	No	13	6.4%

DISCUSSION

In our study, before the BLS training, only 24 participants (11.3%) reported being very familiar with BLS, while 86 (40.6%) were not familiar at all. After the training, all 212 participants (100.0%) reported being very familiar. A study similar to the results of our study, it has been found that less than 30% of answers about BLS among university students were correct and the remaining percentage were incorrect¹⁶. Contrast to our findings, other study was conducted on medical students showed that more than 79% of participants have high knowledge related to BLS because they were attended to training sessions which consider important by them¹⁷. According to BLS training, Hamasu et al. was performed a study on students to evaluate the familiarity of BLS before and after training courses, this percentage of knowledge among them was elevated from 13% to 77% which reflect the effectiveness of these sessions in enhancing the awareness regarding this aspect¹⁸. The training on BLS skills can affect function of some organs such as the heart, as the the full knowledge about its procedures keep the patient from any cardiac complications including cardiac arrest. In addition to that, these procedures can prevent the occurrence of hypoxia thus can cause unbalanced body functions. From this perspective, the importance of having sessions related to BLS to make the providers more familiar with it is very important to increase the survival rates and to prevent any negative complications that may deteriorate the patient life's¹⁹.

In our study, recognition of emergency symptoms improved from 79 participants (41.1%) pre-training 212 (100.0%) following the course.

Correct identification of the BLS sequence increased from just 30 participants (14.5%) to 212 (100.0%) following the course. Regarding perceived improvement, only 77 participants (36.5%) initially reported significant improvement, compared to 212 (100.0%) after training. Confidence also improved markedly, before training, only 49 participants (23.6%) reported very confident, while after the course, all 212 participants (100.0%) reported very high confidence. These findings were consistent with a study conducted on participants and showed that the knowledge among them increased by 20% after the training courses to reach to 80% which is considered a high percentage²⁰. Other study was aligned with our result related to the BLS identification, where Abolfotouh et al. found good attitudes among healthcare professionals after they completed the courses related to BLS as these education courses enhance their BLS experiences²¹. One study on medical students to demonstrate the effectiveness of training on them, after BLS training the awareness and understanding among them was improved dramatically^{22,23}. Moreover, a study done by Artawan et al. to compare the level of knowledge of BLS procedures among participants before and after exposure to the training programs. This study revealed that the knowledge was 63% and 97.5% before and after these sessions, respectively²⁴. Emergency warnings included some signs such as cardiac arrest, unresponsiveness, breathing obstruction, and pulse abnormalities and it is essential to identify them to avoid any possible injuries or complications⁷. According to BLS sequence it consists of some steps related to the patient including ensuring safety, responsiveness, and airway. In addition to that we must determine if the patient need to urgent CPR and chest compression. These steps can summarize by ABC which stand for airway, breathing, and circulation, respectively^{9,10}.

In our study, the results demonstrated a statistically significant improvement in participants' knowledge and perceived training effectiveness after the BLS course. The mean knowledge score increased from 1.28 before training to 4.00 after training ($p = 0.001$). Similarly, the mean training effectiveness score rose from 4.63 to 600 ($p=0.001$). These were consistent with studies conducted by Pande et al and Srivilaithon et al as both of them have been confirmed that BLS knowledge after a period of training was significantly increased among participants^{22,25}. On the other hand, Riegel et al, Spooner et al, and Ruijter et al had inconsistent findings compared to our studies. As they found that the BLS knowledge was decreased after certain time of taking the training sessions²⁶⁻²⁸. The BLS involves use of CPR and defibrillation which may require some practice to do them well. As a result, the BLS training programs is crucial and play a significant role in ensuring performer these processes with high accuracy and skill²¹.

In our study, following the BLS training, 174 participants (96.1%) were able to perform chest compressions correctly, and 167 (88.8%) correctly identified the compression-to-breathing ratio. Ghauri et al conducted a study to demonstrate the difference of knowledge pre and post BLS training. They found that after the CPR sessions, the participants recorded high points than before them, as they were 74.22% and 100%, before and after these sessions respectively²⁹. As for chest compression, a study results were consistent with our findings as it showed the significant increasing toward chest compression as they were 58.8% pre-training and 88.2% post-training workshops³⁰. Chest compression performed by make a pressure on patient chest by moving the provider his arms in straight movement with depth that between five to six cm³¹.

In our study, only 13 participants (9.0%) practiced using an AED. While most participants (82.7%) reported no difficulty understanding the training method, the same percentage (82.7%) found the training facilities adequate for hands-on practice. A study done on nurses to

assess the ability of practicing AED, only 17.5% had a good experience with using it, while 15.9% among them were had high confidence with defibrillators³². AED is beneficial in preventing cardiac arrest, as it helps in keep the heart rhythm normal and improve the blood flow into it³³.

In our study, notably, a strong majority (189, 93.6%) supported making BLS training mandatory in schools. In Pakistan, a study was highlighted the importance of BLS education among students in schools to improve their knowledge and enhance their ability to deal with urgent cases, as a result, they encouraged the materials that linked with this topic in schools³⁴. Also, another study was confirmed the importance of incorporating the BLS knowledge with university subjects to provide students with all important information that may help them to manage any emergency problems³⁵.

CONCLUSION

BLS considers important to manage the emergency cases such as cardiac arrest, airway obstruction, and respiratory failure. This study aims to demonstrate the level of BLS training among students in schools in Riyadh, it has been found that the training had a significant effect on increasing the knowledge related to BLS as the student number reached 100% after most of training sessions and workshops. BLS training give sufficient skills to individuals about working with life threatening conditions to support and promote patient's life. This highlighted the importance of encouraging the implementation of BLS training among students to enhance their knowledge and abilities to use some techniques such as CPR and defibrillation to deal effectively with some emergent situations. On the other hand, there is some limitations that may affect the efficiency of training such as handling with specific devices like AED as some participants had some difficulties in dealing with such instruments.

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