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Original article

Knowledge and Attitude towards Basic Life Support Among Healthcare Professionals in Primary Health Care Centers in Hai Al-Andalus, Tripoli

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Keywords.
Basic Life Support (BLS), Cardiopulmonary Resuscitation (CPR), Primary Health Care, Tripoli, Libya, Healthcare Professionals.

ABSTRACT

Basic Life Support (BLS) is a critical component of the chain of survival in cardiac arrest management. In Libya, healthcare professionals are the first line of defense, yet empirical data regarding their BLS proficiency in primary care settings is limited. This study evaluated the knowledge of and attitudes toward Basic Life Support (BLS) guidelines among various healthcare professional categories in primary healthcare (PHC) centers within the Hai Al-Andalus municipality in Tripoli, Libya. A prospective, descriptive cross-sectional study was conducted between August and December 2022. A self-administered questionnaire was distributed to a random sample of Libyan healthcare providers, including doctors, dentists, pharmacists, nurses, and laboratory workers. Data were analyzed using independent t-tests and Chi-square tests, with statistical significance set at $p < 0.05$. A total of 399 participants completed the survey (99.75% response rate), with a female majority (90.5%) and a mean age of 37.9 ± 8.0 years. While a positive attitude and a strong desire for further BLS training were expressed by over 75% of participants across all specialties, the overall knowledge scores were below average. Doctors demonstrated the highest proficiency (51.6% good knowledge), whereas laboratory workers and nursing staff exhibited significantly lower scores (45.6% and 37.6% below average, respectively; $p = 0.001$). A critical gap was identified, as a vast majority had never received formal or recent BLS training, primarily due to busy clinical schedules. There is a significant deficiency in theoretical BLS knowledge among PHC professionals in Tripoli, despite highly positive learning attitudes. Immediate institutional interventions are essential to integrate mandatory, regular BLS certification and in-situ simulation training into the primary healthcare professional framework to ensure patient safety and improve survival outcomes.

Introduction

Sudden Cardiac Arrest (SCA) remains one of the leading causes of mortality worldwide, accounting for millions of deaths annually. Survival following an out-of-hospital cardiac arrest (OHCA) is critically time-dependent, relying heavily on the "Chain of Survival." The immediate initiation of high-quality Cardiopulmonary Resuscitation (CPR) and early defibrillation are the most significant factors in improving survival rates and neurological outcomes. To understand SCA, it helps to understand how the heart works. The heart has an electrical system that controls the rate and rhythm of the heartbeat. Problems with the heart's electrical system can cause irregular heartbeats called arrhythmias. There are many types of arrhythmias. During an arrhythmia, the heart can beat too fast, too slow, or with an irregular rhythm. Some arrhythmias can cause the heart to stop pumping blood to the body. These arrhythmias cause SCA [1]. Healthcare professionals should know basic life support because they often encounter these situations [2]. A 70% of out-of-hospital cardiac arrests (OHCAs) occur in the home, and approximately 50% are unwitnessed. Outcomes from OHCA remain poor. Only 10.8% of adult patients with non-traumatic cardiac arrest who have received resuscitative efforts from emergency medical services (EMS) survive to hospital discharge. In-hospital cardiac arrest (IHCA) has a better outcome, with 22.3-25.5% of adults surviving to discharge [3]. Adequate knowledge and awareness of BLS

CPR is a vital issue to ensure that individuals can deliver necessary life-saving measures in cases of emergency [4,5]. Health care professionals should have a sound knowledge of BLS because they often encounter emergency situations [6]. Health care professionals should be competent and confident enough to resuscitate from the very beginning of their courses. In the USA, a BLS training course has been suggested for all health care providers since 1966, particularly to those who are involved in resuscitation [8].

The level of knowledge and attitude of health care professionals is variable, as evidenced by several surveys conducted in different parts of the world. The demand for BLS courses is ever-increasing in the developed countries. However, in the underdeveloped and developing countries, training is not routinely practiced. A survey conducted in a hospital setup in Nepal revealed that the medical and paramedical professionals lack adequate knowledge of CPR/BLS. Only 9 of a total of 121 participants correctly answered more than 11 questions out of 15 [2]. Recent updates from the American Heart Association (AHA) 2020 guidelines have emphasized the 'Chain of Survival' by adding a sixth link: Recovery. This highlight

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indicates that Basic Life Support (BLS) is not only about immediate survival but also about the long-term rehabilitation and psychological well-being of cardiac arrest survivors [12].

Literature Review

The proficiency of healthcare professionals in Basic Life Support (BLS) has been a subject of extensive global research. Despite the consensus on its life-saving potential, studies consistently reveal a gap between professional expectations and actual knowledge levels. Global Perspectives on BLS Knowledge: International studies have shown varying degrees of BLS competence. For instance, research conducted in New Zealand [49] indicated that while the community maintains a positive attitude toward CPR, theoretical knowledge remains poor. Similarly, a survey in Nepal revealed that a significant majority of medical and paramedical professionals lacked adequate knowledge, with only a small fraction answering core questions correctly. In Ethiopia, findings suggested that nearly half of graduating health science students lacked the necessary skills and knowledge to perform BLS effectively. Regional Findings (Middle East and North Africa. In the Arab region, the trend remains similar. Studies in Saudi Arabia have frequently reported low levels of BLS knowledge among both healthcare students and practicing professionals. For example, research at Qassim University [9] and a Saudi women's university identified a critical need for standardized training programs. Similarly, in Egypt [47], studies among junior doctors and medical students demonstrated suboptimal CPR knowledge, highlighting a deficiency in the current medical curriculum.

The Situation in Libya: While there is growing interest in emergency medicine in Libya, local data remains scarce. Road traffic accidents and sudden cardiac arrests are major health hazards in the country, yet the preparedness of primary healthcare (PHC) staff is not well-documented. This study serves to address this void by providing the first empirical assessment of BLS knowledge and attitudes in the Hai Al-Andalus municipality of Tripoli. Barriers to Training: A common theme across the literature is the presence of barriers to training. While attitudes toward acquiring BLS skills are generally optimistic, factors such as busy schedules, high course costs, and the lack of mandatory certification requirements often hinder professionals from maintaining their competency. Cardiac arrest is the abrupt loss of heart function in a person who may or may not have been diagnosed with heart disease.

It can come on suddenly or in the wake of other symptoms. Cardiac arrest is often be fatal if appropriate steps aren't taken immediately. More than 356,000 cardiac arrests occur outside a hospital in the U.S. each year [23]. The global landscape of Cardiopulmonary Resuscitation (CPR) and Basic Life Support (BLS) has undergone significant evolution following the release of the 2020 American Heart Association (AHA) [12] and European Resuscitation Council (ERC) guidelines. A major paradigm shift is the introduction of the "Sixth Link" in the Chain of Survival, which emphasizes Recovery [2]. This link focuses on the long-term multimodal rehabilitation and psychological support for cardiac arrest survivors [12].

Recent evidence underscores the critical role of training methodology in maintaining skill proficiency. Traditional biennial training models are increasingly being replaced by low-dose, high-frequency "refresher" sessions. Studies have shown that BLS skills, particularly chest compression quality, begin to decay as early as three to six months post-training. To combat this, the use of real-time audiovisual feedback devices during training has become a standard recommendation, as they significantly improve the consistency of compression depth and rate. "Current evidence suggests that BLS skills, particularly chest compression quality, significantly decay within 3 to 6 months post-training. To address this, the European Resuscitation Council (ERC) 2021 guidelines recommend the integration of high-frequency, low-dose 'refresher' training sessions and the use of real-time audiovisual feedback devices to ensure high-quality CPR. (4) Furthermore, the integration of digital health and mobile technology has emerged as a vital strategy for improving out-of-hospital cardiac arrest (OHCA) outcomes. Modern systems now utilize smartphone applications to alert volunteer first responders to nearby emergencies, effectively bridging the gap before professional medical services arrive.

In the context of primary healthcare, recent literature from neighboring regions (e.g., Egypt and Saudi Arabia) continues to report a persistent gap between positive healthcare provider attitudes and actual theoretical knowledge. This disparity is often attributed to systemic barriers such as clinical workload and the high cost of certification. These global and regional trends emphasize the urgent need for institutionalizing mandatory, accessible, and technologically supported BLS training programs within primary care settings.

Materials and Methods

Study design

A prospective, descriptive, cross-sectional study was conducted to evaluate the knowledge and attitudes regarding Basic Life Support (BLS) among healthcare providers. The study was carried out over a five-month period, from August 1st to December 30th, 2022.

Study Setting and Population

The research was situated within Primary Health Care (PHC) centers in the Hai Al-Andalus municipality, Tripoli. The study population comprised a multidisciplinary group of healthcare professionals, including:

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* Physicians (Doctors)
* Dentists
* Pharmacists
* Nursing staff
* Laboratory technicians

Selection Criteria and Sampling: A random sampling technique was employed to select participants from the designated PHC centers.

* Inclusion Criteria: The study included all Libyan healthcare professionals who were on duty during the site visits.
* Exclusion Criteria: Professionals of non-Libyan nationality and those who chose not to participate were excluded.

The final sample size consisted of 400 participants, effectively representing the specialized workforce distribution within the municipality.

Data Collection Instrument

Data were collected through structured personal interviews using a self-explanatory, pre-tested questionnaire containing 14 items. The tool was designed to capture three main dimensions:

1. Socio-demographic Profile: Including age, gender, medical specialty, and years of clinical experience.
2. Knowledge Assessment: Evaluating theoretical understanding of BLS protocols (e.g., compression-to-ventilation ratios, recovery positions, and victim positioning).
3. Attitudinal Assessment: Gauging perspectives on BLS training, its necessity in curricula, and barriers to obtaining certification.

Data Management and Statistical Analysis

The collected data was coded and analyzed statistically. The significance of the findings was determined using: Independent t-tests and Chi-square (x2) tests to compare mean knowledge scores and categorical variables across different specialties and genders. A p-value of < 0.05 was considered the threshold for statistical significance.

Data Cleaning and Exclusion Criteria

A total of 400 questionnaires were distributed during the study period. Upon data entry and verification, one questionnaire was found to be incomplete, with missing responses in key knowledge assessment items. Consequently, this incomplete response was excluded from the final analysis to maintain data integrity. The final statistical analysis was performed on 399 complete responses, yielding an effective response rate of 99.75% (pp. 1, 6).

Results

The study was conducted in primary health care centers at the Municipality of Hai Al-Andalus in Tripoli from 1.8.2022 to 30.12.2022.

Characteristic of study population

Out of 400 subjects, 399 completed the survey with a response rate of (99%). Among 400 responses received, 1 was incomplete. So he was excluded from the survey. Finally, 399 complete responses were selected for the final statistical analysis. The mean age for the study participants was 37,88 ±7,99 years old. Of 399 participants, 38 (9.5%) were males, and 361 (90.5%) were females. The male-to-female sex ratio in the entire group of respondents was (1: 9.5) (Table 1).

Table 1. Distribution of participant characteristic.

Parameters	N	%
Gender:		
Male	38	9.5 %
Female	361	90.5%
Age Group (years):		
20 - 29	43	10.8 %
30 - 39	209	52.4 %
40 - 49	104	26.1 %
50 - 60	43	10.8 %
Specialty:		
Doctors	62	15.5 %
Dentists	15	3.8 %
Pharmacists	54	13.5%

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Lab workers	79	19.8 %
Nurses	189	47.4 %

N=number, %=percentage.

The distribution of participants according to gender and specialty.

The percentage of females is much higher than the percentage of males in all specialties within the primary health care centers, as the percentage of nursing reached 47.4% of the total participants in this research, while the percentage of dentists was only 3.8%, doctors 15.5%, pharmacists 13.5%, and laboratory workers 19.8% (Figure 1).

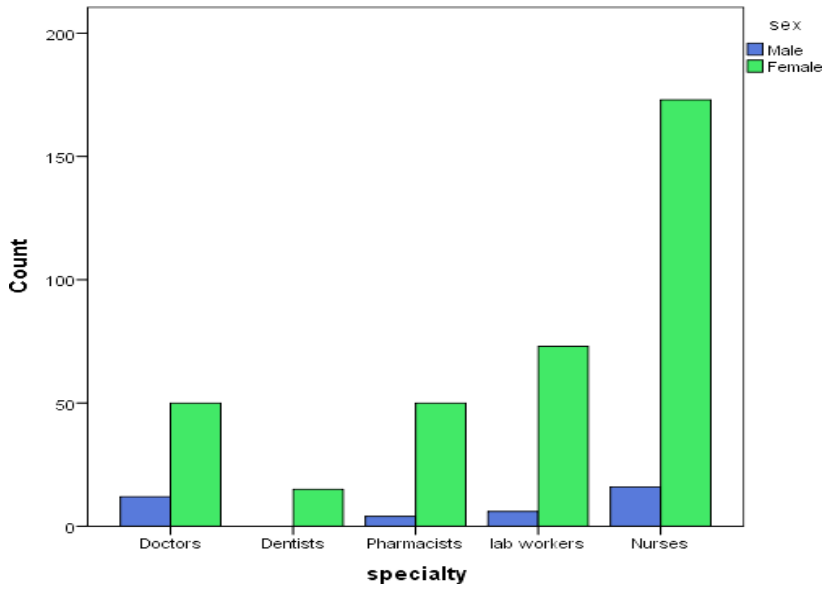

Figure 1. The distribution of participants according to gender and specialty

The distribution of participants according to ages and specialty.

The majority of participants are between the ages of 30 and 39 years, but the nursing category is still clearly high in the age period between 40 and 49 years, and doctors are almost non-existent in the period between 20 and 29 years old (Figure 2).

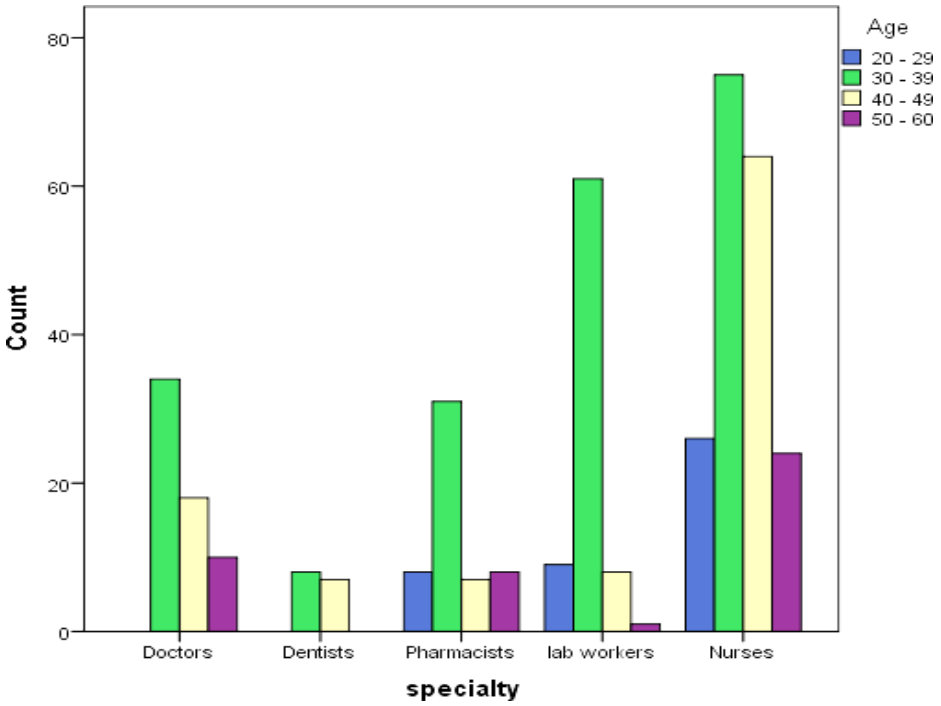

Figure 2. The distribution of participants according to ages by year and specialty

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Distribution of knowledge scores according to specialty.

The knowledge score is divided into four groups according to the percentage of answered questions. The percentage of good scores among doctors is 51.62%. The lab workers 'good score is 8.86%. There is a significant association between specialty and knowledge, significant; p = < 0.001, df =12

Table 2. Distribution of knowledge score according to specialty

Specialty	Poor (<25%)	Below Average (25-50%)	Average (>50%)	Good (>65%)	
Doctors	6.45%	6.45%	35.48%	51.62%	P Value < 0.001
Dentists	0.00%	33.33%	46.67%	20.00%	
Pharmacists	5.56%	48.15%	33.33%	12.96%	
lab workers	7.59%	45.57%	37.98%	8.86%	
Nurses	10.58%	37.57%	41.80%	10.05%	

Distribution of knowledge score according to gender

There is no significant difference between males and females in the knowledge score, not significant; p = 0.17, df =3

Table 3. Distribution of knowledge score according to gender

knowledge scores	Sex		
	Male	Female	
Poor < 25%	10.52%	8.03 %	**P Value 0.17**
Below Average 25- 50%	21.05%	37.12%	
Average > 50%	42.11%	48.78%	
Good > 65%	26.32%	16.07%	
Total	100 %	100 %	

Distribution of the mean knowledge scores according to the gender and specialty of the participants

The results showed the distribution of mean knowledge scores according to the gender and specialty of the participants. The mean knowledge score of doctors was 3.32 ± 0.86 the mean knowledge score of lab workers was 2.48 ± 0.77.

Table 4. Distribution of the mean knowledge scores according to the gender and Specialty of the participants

Sex	Specialty	N	Mean	Std. Deviation
Male	Doctors	12	3.42	0.67
	Pharmacists	4	3.25	0.50
	lab workers	6	2.83	1.17
	Nurses	16	2.31	0.87
	Total	38	2.84	0.95
Female	Doctors	50	3.30	0.91
	Dentists	15	2.87	0.74
	Pharmacists	50	2.48	0.79
	lab workers	73	2.45	0.72
	Nurses	173	2.53	0.81
	Total	361	2.63	0.85
Total	Doctors	62	3.32	0.864
	Dentists	15	2.87	0.74
	Pharmacists	54	2.54	0.79
	lab workers	79	2.48	0.77
	Nurses	189	2.51	0.82
	Total	399	2.65	0.86

Distribution of attitude

By studying the attitude of the participant, four questions were presented.

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Previous training of participant on BLS:

The study revealed that 41 (66.1%) of doctors, 1 (6.7%) of dentist, 10 (18.5%) of pharmacists, 5 (6.3%) of lab workers, and 48 (25.4%) of nurses had received previous BLS training.

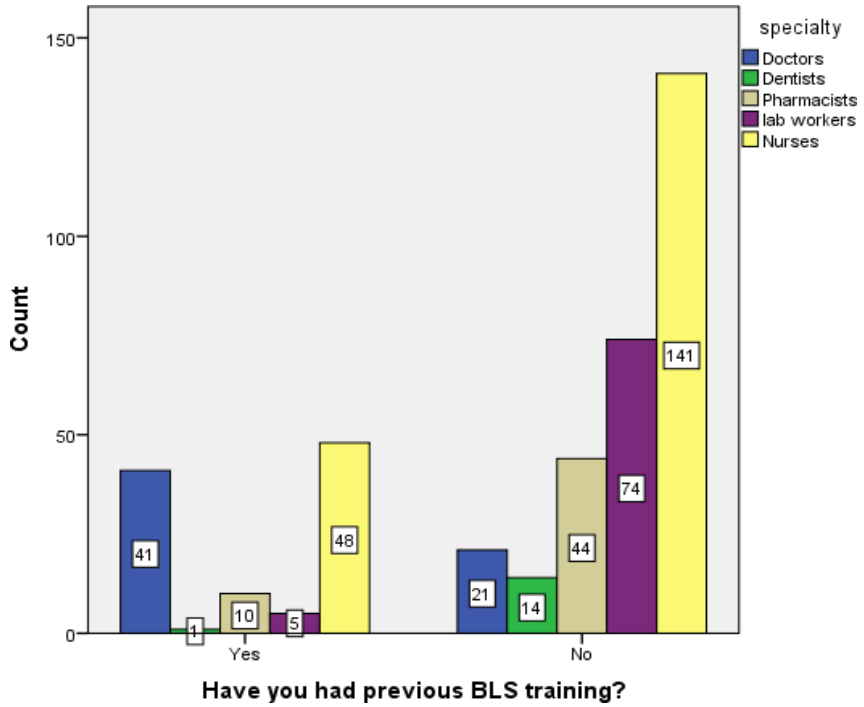

Figure 3. Distribution of participants according to previous training on BLS

Needs for more training on BLS

According to the response of participants about the need for more training, the result showed that 117 (61.9%) of nurses need more training in basic life support, and 51 (82.3%) of doctors need more training in basic life support.

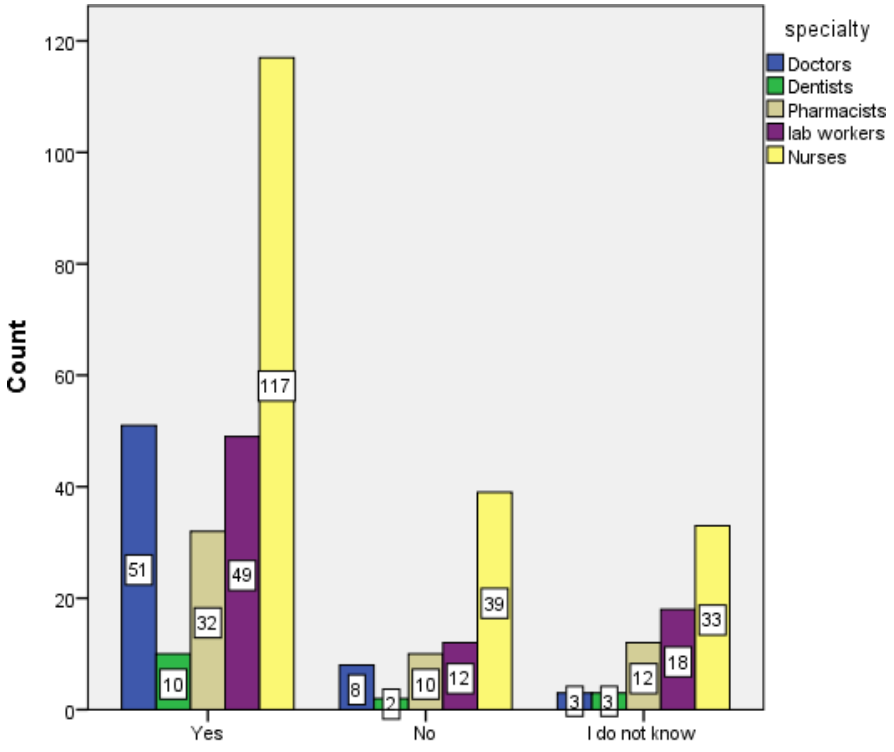

Figure 4. Distribution of participants according to needs for more training on BLS

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Perception of participants about the importance of BLS in faculty curriculum

According to the opinion of the study population in the present study, 144(76.2%) of nurses' perceptions about the importance of BLS in the faculty curriculum answered yes, and 56 (90.3%) of doctors' perceptions about the importance of BLS in the faculty curriculum answered yes.

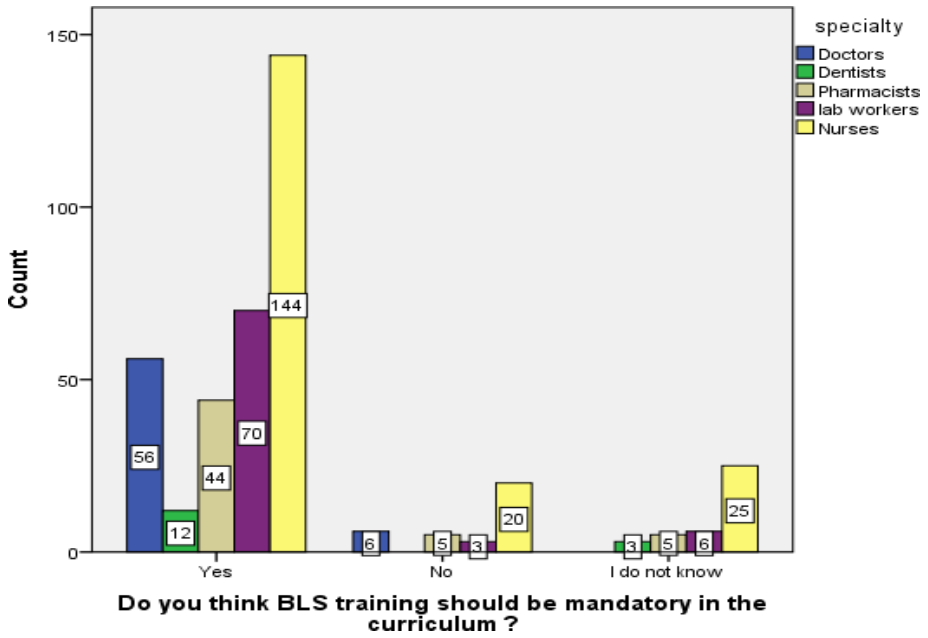

Figure 5. Distribution of participants according to perception about the importance BLS in faculty curriculum.

Causes of non-training of participants on BLS

The causes of non-training in BLS among participant were:
busy schedule among doctors were 37(59.6%) and among nurses were 96 (50.8%).

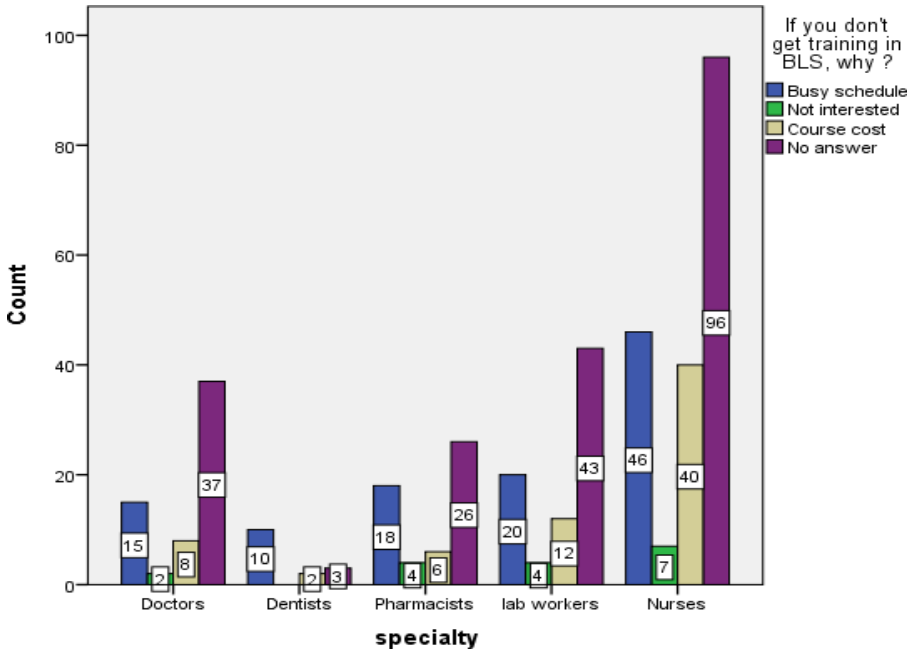

Figure 6. Distribution of participants according to the causes of non-training of participants on BLS.

Discussion

According to the studies and reports, road traffic accidents and sudden cardiac deaths are the major health hazards [11] in all the major trauma and cardiac arrest cases, BLS support is required to save life in a pre-hospital facility. The BLS program is designed to deliver knowledge to a wide range of healthcare professionals about several life-threatening emergencies. It also demonstrates training to provide BLS, in the use of an AED, and to relieve choking in a safe, timely and effective manner

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to treat those emergencies. It is mandatory for all healthcare professionals to have a comprehensive knowledge and skill about BLS. In the present scenario, there is a main problem with skills and obsolete information regarding the BLS [13,14]. Hence, all healthcare units should emphasize training the healthcare providers in BLS. To the best of the author's knowledge, this is the study evaluating and comparing the knowledge of BLS among health care professionals in primary health care centers in Hai Al-Andalus, Tripoli.

In the present study, the mean score about knowledge of BLS among participants was 2.65±0.86 with a score range of 0-10, as opposed to an Indian study showing a mean score of 1.22 +0.91 with a score range of 0-4 [5]. A recent study conducted at the women's university in Saudi Arabia revealed that 87.9% of the participants had very poor knowledge scores [15]. Another study conducted on dental students revealed that almost 67% of the participants had a poor knowledge score [16]. In our study, comparison of knowledge between male and female participants revealed no significant difference, with scores 2.84: 95 and 2.63: 85, respectively. Only about 17% of the participants answered the correct ratio of chest pressure to ventilation in an adult. Also, about 25% of the participants provided the correct answer to the Recovery position. Around 73% percent of the participants submitted the correct answers regarding the best position for the victim when performing BLS. The comparison of knowledge among different specialties was statistically significant, with the highest score for doctors (3.32 ± 0.864) and the lowest for lab workers (2.48 ± 0.766). In the present study, most of the participants showed a positive attitude towards BLS training, which is similar to other studies conducted by Kumar et al, Carvalho et al. Roshana et al, [2,17]. About 66.1% of the doctors and 6.7% of dentists had previous BLS sessions, whereas 25.4% of nurses and 18.5% and pharmacists and workers had previous experience with BLS training. A high proportion of professionals from all the specialties didn't receive BLS training in the past. This finding should be explored further by a personal interview to evaluate the possible reason for the same. According to a room study, the knowledge of the trained subjects was more than that of the untrained subjects [18]. Reinforcement and refresher courses are necessary for better cognition. Various authors have recommended that healthcare professionals have hands-on courses regularly to master the skills and refresh knowledge about BLS [19,20]. The majority of participants across all the specialties showed a positive attitude towards an additional BLS training program. These additional sessions will help them to update their knowledge. The study revealed that there is a significant decay of the skill and knowledge about BLS [14]. When the participants from the various specialties were asked about the inclusion of the BLS training program in their course curriculum, 61.9 to 82.3% participants replied positively. A recent study conducted by Maha et al. showed that internal BLS training performed in colleges showed a better result than external training [15].

Various authors have recommended integrating a BLS training program into the undergraduate curriculum so that the healthcare students will get early exposure to such a program [21,22]. In the current study, no answer (ambiguous about the reason for not getting training) was the reason given by most participants for not getting BLS training. About one third of the total participants had a busy schedule the reason for not getting training. Some participants had opted for increased course costs, and a few of them did not feel the need to get trained for BLS. About 35.6 to 39.1% of the participants declared that they have average knowledge about the BLS. A poor score of knowledge was declared by fewer participants (8.3%). The differences in scores among different specialties were statistically significant. Despite having a good attitude and self-declared average knowledge by the participants. Similar findings were observed in another study, in which participants stated that they had good knowledge, but most of them failed to provide more than 6 correct answers out of 12 questions [5].

Although the study involved professionals from primary health care units, the study failed to evaluate the skill for BLS among participants. This limitation was because of the fact that the study was questionnaire based. Further studies are recommended to evaluate the actual practical skills of the professionals and health care workers in Tripoli. "The low knowledge scores observed in our study (Mean: 2.64) align with recent global findings that highlight a training gap in primary care settings. Modern strategies now advocate for blended learning models—combining online theory with brief hands-on practice—which have proven more effective than traditional biennial courses. Furthermore, the positive attitude of our participants toward mandatory training (up to 90%) supports the global shift toward institutionalizing BLS as a core competency for all healthcare providers [6].

Conclusion

The study concludes that healthcare professionals in the Primary Health Care (PHC) centers of Hai Al-Andalus, Tripoli, possess a below-average level of knowledge regarding Basic Life Support (BLS). While doctors demonstrated relatively better theoretical understanding than other specialties, the overall proficiency remains insufficient for effective emergency response. A significant finding is the positive attitude shared by the majority of participants toward BLS training and its integration into medical curricula. However, this positive intent is hindered by practical barriers, primarily heavy workloads and the high cost of training programs. The lack of previous formal training among a high proportion of staff indicates a critical gap in the continuous professional development (CPD) framework within the Tripoli PHC sector.

Recommendations

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Based on the critical gaps identified in this study regarding BLS knowledge among primary healthcare (PHC) professionals in Tripoli, the authors propose the following structured recommendations:

- Institutionalization of Mandatory BLS Certification: The Ministry of Health and PHC administrations should establish regular, accredited BLS certification as a mandatory prerequisite for clinical practice, contract renewals, and annual professional relicensing across all healthcare cadres.
- Targeted Educational Interventions: Continuous Professional Development (CPD) departments must implement urgent, customized training programs tailored specifically for nursing and laboratory staff, who demonstrated the most significant knowledge deficiencies.
- Integration of In-Situ Simulation and Mock Drills: To overcome the barrier of busy clinical schedules, healthcare centers should transition from traditional lecture-based training to brief, unannounced in-situ simulation drills (mock codes) directly within the workplace.
- Standardization of National PHC Guidelines: Standardized, updated Arabic and English BLS algorithms and visual charts (based on the latest AHA/ERC guidelines) should be prominently displayed in all emergency and triage rooms within PHC centers.
- Curriculum Reform in Medical and Allied Health Schools: Academic institutions should strengthen undergraduate medical, nursing, and medical technology curricula by integrating longitudinal, practical BLS/AED training with mandatory objective structured clinical examinations (OSCEs) prior to graduation.

References

1. National Heart, Lung, and Blood Institute (NHLBI). What Is Sudden Cardiac Arrest. Bethesda (MD): National Institutes of Health; 2016 [cited 2026 Jun 4]. Available from: nih.gov.
2. Roshana S, Batajoo KH, Piryani RM, Sharma MW. Basic life support: knowledge and attitude of medical/paramedical professionals. World J Emerg Med. 2012;3(2):141–5.
3. Kleinman ME, Brennan EE, Goldberger ZD, Swor RA, Terry M, Bobrow BJ, et al. Part 5: Adult Basic Life Support and CPR Quality: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2015;132(18 suppl 2): S414–35.
4. Perkins GD, Graesner JT, Semeraro F, Olasveengen T, Soar J, Lott C, et al. European Resuscitation Council Guidelines 2021: Basic Life Support. Resuscitation. 2021; 161:81–114.
5. Aroor AR, Saya RP, Attar NR, Saya GK, Premkumar R. Awareness about basic life support and emergency medical services among medical students in South India. J Emerg Trauma Shock. 2014;7(3):166–70.
6. Olasveengen TM, Mancini ME, Perkins GD, Avis S, Brooks S, Castrén M, et al. Adult basic life support: 2020 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Circulation. 2020;142(suppl 1): S41–91.
7. Saquib SA, Al-Harthi HM, Al-Amri AA, Al-Malki MA, Al-Subhi AM, Al-Zahrani NM, et al. Knowledge and Attitude About Basic Life Support Amongst Healthcare Interns. Emerg Med Int. 2019; 2019:9142892.
8. Saquib S, Al-Harthi H, Al-Amri A. BLS Knowledge in University Hospitals: A Cross-Sectional Study. Emerg Med Int. 2019; 2019:9342892.
9. Almesned A, Al-Asmary M, Al-Mohaissen MA. BLS Knowledge of Healthcare Students in Qassim University. Int J Health Sci (Qassim). 2014;8(2):141–50.
10. Alanazi A, Alotaibi A, Al-Fraih M. Poor BLS awareness among medical students. Middle-East J Sci Res. 2014; 21:848–54.
11. Shanks NJ, Ansari M, de Moor C. Road traffic accidents in Saudi Arabia. Public Health. 1994;108(1):27–34.
12. Sawyer KN, Camp-Rogers TR, Kotini-Shah P, Del Rios M, Gadhia RA, Groisman-Perelstein AI, et al. Sudden Cardiac Arrest Survivorship: A Scientific Statement From the American Heart Association. Circulation. 2020;141(12): e654–85.
13. Chamberlain D, Smith A, Colquhoun M, Handley AJ, Kern KB, Woollard M, et al. Trials of teaching methods in basic life support: comparisons of resuscitation training for the police. Resuscitation. 2002;53(2):179–87.
14. Federico S, Lynch B, Farrington K. Retention of CPR performance in anesthetists. Resuscitation. 2006;68(1):101–8.
15. Al-Mohaissen MA. Knowledge and attitudes towards basic life support among health students in Saudi Arabia. SQU Med J. 2017;17(1): e59–65.
16. Alotaibi O, Alamri F, Almuflehi N. Basic life support: Knowledge and attitude among dental students. Saudi J Dent Res. 2016;7(1):51–6.
17. Carvalho RM, Costa LR, Marcelo VC. Brazilian dental students' perceptions about medical emergencies: a qualitative study. J Dent Educ. 2008;72(11):1343–9.
18. Abbas A, Bukhari SI, Ahmad F. Knowledge of first aid and basic life support amongst medical students in Karachi, Pakistan. JPMA. 2011;61(6):613–8.

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Libyan Medical Journal
https://lmj.ly/index.php/ojs/index eISSN: 2079-1224

19. Farah R, Stiner E, Zohar Z, Eisenman A. Cardiopulmonary resuscitation surprise drills for assessing hospital personnel skills. Eur J Emerg Med. 2007;14(6):332–6.
20. Morgan R, Westmoreland C. Survey of junior doctors' attitudes to cardiopulmonary resuscitation. Postgrad Med J. 2002;78(921):413–5.
21. Zaheer H, Khan Z. Awareness about basic life support among medical students. JPMA. 2009;59(1):57–9.
22. Pande S, Pande S, Parate V. Evaluation of retention of basic life support knowledge in first year medical students. Adv Physiol Educ. 2014;38(1):42–5.
23. American Heart Association (AHA). CPR Facts and Stats. Dallas (TX): American Heart Association; 2020 [cited 2026 Jun 4]. Available from: heart.org.
24. Merchant RM, Topjian AA, Panchal AR, Cheng A, Aziz K, Berg KM, et al. Part 1: Executive Summary: 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2020;142(16_suppl_2): S337–57.
25. Considine J, Shaban RZ, Curtis K, Fry M, Dualé Y. Chest compression components: A scoping review of basic life support guidelines. Resuscitation. 2020; 146:188–202.
26. Stiell IG, Brown SP, Christenson J, Cheskes S, Nichol G, Powell J, et al. What is the optimal chest compression depth during out-of-hospital cardiac arrest resuscitation? Circulation. 2014;130(22):1962–70.
27. Babbs CF, Nadkarni V. New paradigm for human resuscitation research using intelligent mechanical devices. Resuscitation. 2008;77(3):306–15.
28. Hwang SO, Zhao LZ, Kim S. Randomized controlled trial of chest compression rates during cardiopulmonary resuscitation. J Korean Med Sci. 2016;31(9):1491–8.
29. Olasveengen TM, Mancini ME, Perkins GD, Avis S, Brooks S, Castrén M, et al. Adult basic life support: 2020 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations. Circulation. 2020;142(16_suppl_1): S41–91.
30. White L, Rogers J, Bloomingdale M. Dispatcher-assisted CPR: risks and benefits of bystander intervention. Circulation. 2010;121(1):91–7.
31. Tanaka Y, Taniguchi J, Shioji R. Development of a standardized protocol for dispatcher-assisted CPR. Circulation. 2014;129(17):1751–8.
32. Beck LR, Ostermier GR, Ramirez-Gutierrez RE. Effectiveness of Dual Sequential Defibrillation in refractory ventricular fibrillation. Prehosp Emerg Care. 2019;23(5):597–603.
33. Cheskes S, Verbeek PR, Drennan IR, McLeod SL, Turner L, Pinto R, et al. Defibrillation Strategies for Refractory Ventricular Fibrillation: The DOSE VF Pilot Randomized Controlled Trial. Resuscitation. 2020; 150:178–86.
34. Berg KM, Cheng A, Raymond TT, Topjian AA, Aziz K, Chandler HK, et al. Adult advanced life support: 2020 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science With Treatment Recommendations. Circulation. 2020;142(16_suppl_1): S92–139.
35. Granfeldt A, Avery EE, Ward KR. Intravenous versus intraosseous administration of drugs during cardiac arrest: A systematic review. Resuscitation. 2020; 149:150–7.
36. Nguyen L, Toon J, Hoskins B. IV vs. IO Access in Prehospital Cardiac Arrest: A Clinical Review. Air Med J. 2019;38(3):147–52.
37. Jacobs IG, Finn JC, Jelinek GA, Oxer HF, Thompson PL. Effect of adrenaline on survival in out-of-hospital cardiac arrest: A randomised placebo-controlled trial. Resuscitation. 2011;82(9):1138–43.
38. Perkins GD, Ji C, Deakin CD, Nolan JP, Lall R, Scomparin C, et al. A Randomized Trial of Epinephrine in Out-of-Hospital Cardiac Arrest (PARAMEDIC2). N Engl J Med. 2018;379(8):711–21.
39. Panchal AR, Berg KM, Kudenchuk PJ, Del Rios M, Hirsch KG, Link MS, et al. 2019 American Heart Association Focused Update on Advanced Cardiovascular Life Support: An Update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2019;140(24): e881–94.
40. Holmberg MJ, Granfeldt A, Guerguerian AM. Vasopressors during adult cardiac arrest: A systematic review. Resuscitation. 2019; 139:106–15.
41. Dezfulian C, Lapoint JM, Toone E, et al. Opioid-Associated Out-of-Hospital Cardiac Arrest: Distinctive Clinical Features and Implications for Health Care and Public Responses: A Scientific Statement from the American Heart Association. Circulation. 2021;143(13): e836–49.
42. Jeejeebhoy FM, Zelop CM, Lipman S, Vanden Hoek TL, Campbell TA, Mhyre JM, et al. Cardiac Arrest in Pregnancy: A Scientific Statement from the American Heart Association. Circulation. 2015;132(18):1747–73.
43. Dijkman A, Huisman CM, Smit M, Schutte JM, Zwart JJ, van Roosmalen JJ, et al. Cardiac arrest in pregnancy: a nationwide cohort study of 49 cases and a review of perimortem section. BJOG. 2010;117(3):282–7.

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https://doi.org/10.69667/lmj.26903
Libyan Medical Journal
https://lmj.ly/index.php/ojs/index eISSN: 2079-1224

44. Callaway CW, Donnino MW, Fink EL, Geocadin RG, Golan E, Kern KB, et al. Part 8: Post-Cardiac Arrest Care: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation. 2015;132(18 suppl 2): S465–503.
45. Geocadin RG, Callaway CW, Fink EL, Golan E, Greer DM, Kurz MC, et al. Standards for Neurological Prognostication after Cardiopulmonary Resuscitation: A Scientific Statement From the American Heart Association. Circulation. 2019;140(11): e517–42.
46. Samaniego EA, Mlynash M, Derksen S. Sedation confounds outcome prediction in cardiac arrest survivors. Neurocrit Care. 2011;15(1):113–9.
47. Mohammed Z, Ahmed B, El-Ghamry R. Cardiopulmonary resuscitation knowledge among junior doctors in Egypt. Int J Emerg Med. 2020;13(1):19.
48. Yun T, Zhang M, Tang W. Attitudes towards cardiopulmonary resuscitation in South China: a cross-sectional study. BMJ Open. 2016;6(12): e012345.
49. Larsen PD, Pearson J, Galletly DC. Knowledge and attitudes towards cardiopulmonary resuscitation in the community. NZ Med J. 2004;117(1193): U871.
50. Tadesse M, Assefa T, Hailemariam T. Basic life support knowledge among graduating health science students in Ethiopia: a cross-sectional study. BMC Med Educ. 2022;22(1):104.

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