Automated External Defibrillator Issues and Challenges in Saudi Arabia: Knowledge Assessment among Laypersons; Public Safety Perspective

Samer A. Al Haliq (✉ saalhaliq@iau.edu.sa)

Imam Abdulrahman Bin Faisal University <https://orcid.org/0000-0001-5821-5539>

Omar M. Khraisat

Al-Ahliyya Amman University

Mohamed A. Kandil

Imam Abdulrahman Bin Faisal University

Mohammed A. Al Jumaan

Imam Abdulrahman Bin Faisal University College of Medicine

Faris M. Alotaibi

Imam Abdulrahman Bin Faisal University

Fahad S. Alsaqabi

Imam Abdulrahman Bin Faisal University

Hussain M. Alajmi

Imam Abdulrahman Bin Faisal University

Hany A. Ellouly

Imam Abdulrahman Bin Faisal University

Mahmoud A. Al-Haliq

The Hashemite University

Abdullah Alkhawaldeh

Jerash University

Mohammed ALBashtawy

Al al-Bayt University

Sawsan H. Abuhammad

Jordan University of Science and Technology

Research article

Keywords: Automated External Defibrillator, Cardiopulmonary Resuscitation, Layperson, Out of Hospital Cardiac Arrest, Saudi Arabia.

Posted Date: October 16th, 2019

DOI: <https://doi.org/10.21203/rs.2.16101/v1>

License: This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: A layperson is the first one who attends the scene in the case of Out-of-Hospital Cardiac Arrest (OHCA). Cardiopulmonary Resuscitation (CPR) is not enough for those patients; they need Automated External Defibrillator (AED) to bring the heart to function normally. This study aimed to assess the current status of CPR & AED knowledge among laypersons.

Methods: Using a descriptive design, study was conducted at seven malls located in the Eastern Province of Saudi Arabia. Two hundred fifty participants were surveyed using American Heart Association (AHA) 2015 guidelines to assess CPR & AED knowledge.

Results: The sample mean age was 32.60 years (SD = 10.02), and (87%) of participants working as security personnel. The mainstream of the participants did not receive training about CPR & AED (75.8%, 95.2% respectively). Common misconceptions are fall into all categories of CPR & AED knowledge. Correctly answered statements ranged from (7.2%) in compression rate to (24.2%) in hand placement).

Conclusions: The study results indicated a poor training of CPR & AED in public settings. Integrating high quality CPR & AED knowledge within the school and college curricula is a vital need. National policy adopted by stakeholders' and decision maker to improve public awareness of CPR & AED and maximize the survival rate. AED public access needs to empower health care system and support community safety regarding Emergency Cardiovascular Care in public settings.

Keywords: Automated External Defibrillator; Cardiopulmonary Resuscitation, Layperson; Out of Hospital Cardiac Arrest; Saudi Arabia.

Background

Cardiovascular disease is a leading cause of worldwide mortality, accounting for approximately 17 million deaths yearly [1]. Approximate 50 to 110 per 100,000 Out of Hospital Cardiac Arrest (OHCA) annual incidence in United States and Europe populations [2, 3]. In the United States, only 10.4% of OHCA who had received resuscitation from Emergency Medical Services (EMS) survived to hospital discharge [3]. In Saudi Arabia, cardiovascular disease mortality rate is 37% according to the World Health Organization (WHO) statistics [4]. A study conducted in Riyadh city in Saudi Arabia reported a high mortality rate of 95.8% among adult OHCA patients; this study reported that poor training of the Cardiopulmonary Pulmonary Resuscitation (CPR) and non-utilization of Automated External Defibrillator (AED) might be the major factors that stand behind the OHCA high mortality rate [5]. Similarly, the study which was conducted among laypersons in 2018 at Jeddah city the second largest city in Saudi Arabia, revealed that the participants perceived a lack of knowledge regarding CPR [6].

Emergency Cardiovascular Care (ECC) 2020 impact goals focus on and make a great effort to doubling cardiac arrest survival rates and out-of-hospital layperson response [7, 8]. Laypersons form the first three links (Recognition and activation of the emergency response system, immediate high-quality CPR, rapid

defibrillation, basic and advanced EMS, advanced life support and post arrest care) of American Heart Association (AHA) to improve the survival rates of adult chain of survival OHCA [9–11].

Chain of survival can be improved through activating the community role by increasing the public awareness regarding the AED needs and outcome [10, 12–14]. The AHA Highlights 2017 recommendations support the laypersons hands on training to perform CPR for OHCA adult victims [10]. CPR alone is not enough, the AEDs are important to restore the normal sinus rhythm and to bring the heart to function normally [12, 15]. Early CPR and AED utilization by laypersons may assist life-saving and it's associated with a two- to three-fold increase in survival when compared to victims who had no CPR & AED before the EMS arrival [9, 13, 16]. Additionally, for most victims AED is not offered until the EMS crews reach the scene, and for every minute delay in defibrillation the chances of survival decline by 10%, so familiarity with Public Access Defibrillation (PAD) may enable rapid defibrillation before EMS arrival [17].

Despite the efforts of focus on the utilization of AED, there are still a lot of AED issues and challenges; research suggests that laypersons face challenges regarding the utilization of AEDs [18]. Moreover, the laypersons are afraid from AEDs that might be dangerous, complicated technically, and difficult to use, because of their limited knowledge and familiarity with them [19].

In Saudi Arabia, 2030 Royal vision was built around three themes: a vibrant society, a thriving economy and an ambitious nation. A vibrant society is supported by an empowering social and health care system. Layperson is the first one who attends the scene in the case of OHCA. Thus, this study aimed generally to assess the need for AED public access that might empower health care system and support community safety regarding ECC in public settings following 2030 vision. Specifically the study aimed to assess the current status of CPR & AED knowledge among laypersons in Saudi Arabia.

Methods

Study Design, Sample, and Setting

A descriptive design was used to assess the current status of CPR & AED knowledge among laypersons in Saudi Arabia.

The study was conducted over a period of three months in seven major malls located in Dammam and AL Khobar, Eastern Province of Saudi Arabia. The inclusion criteria for this study were all employees in the selected malls namely the security guards and administrators who were able to understand written Arabic.

The estimated sample size was calculated using the Power Primer (Cohen, 1992). The test revealed that using a desired power of 0.80, medium effect size ($r = 0.25$), and 0.05 level of significance, the estimated sample size was 200 mall staff. Over-sampling was utilized to gain increased understanding, as well as to overcome participant attrition. Thus, 250 mall employees were selected to participate in the study.

Instruments

The study utilized anonymous self-reported questionnaires. The questionnaire had been designed according to 2015 AHA guidelines and 2017 AHA highlights, and it was adapted to be used in this study. This questionnaire was utilized by many studies to assess the laypersons knowledge of Adult CPR & effective use of AED [10, 11, 15]. The questionnaire was translated and back translated by bilingual PhD holders. A pilot study was conducted to evaluate the clarity and appropriateness of the questionnaire to Saudi Arabia culture.

The questionnaire included two parts. Part one a demographic data sheet that includes questions designed to elicit information about participants' demographic characteristics, such as their age, gender, level of education, job title, whether they have received CPR & AED training or not, additional questions regarding information about the source of CPR & AED training, witnessing cardiac arrest cases while working, and AED device availability in the workplace. The second part includes statements to assess the knowledge of adult CPR & AED utilization. It includes: whether or not they know the EMS number in Saudi Arabia, steps of CPR performance such (Depth, rate, hand placement and compression - ventilation ratio), and the universal steps of AED operation.

Pilot study

A pilot study was conducted at one of the selected malls to test the instrument's psychometric properties, the time required to complete the questionnaire and its clarity. Twenty participants completed the questionnaire within 5–15 minutes. The psychometric evaluation of the English version of the questionnaire was evaluated by content validity. However, the internal consistency of the questionnaire was measured using the Cronbach's Alpha (α) coefficient. Reliability revealed an alpha coefficient of 0.71.

Ethical considerations

An ethical approval was obtained from the Institutional Review Board (IRB) of Imam Abdulrahman Bin Faisal University (Reference number: IRB –2019–03–155). A standard code of ethics for participants and the requirements of the IRB were followed. The study package included an introductory letter explaining the purpose of the study. The participants were informed that their participation was voluntary, they have the right to withdraw from the study at any time without penalty and that all the information obtained would be treated confidentially and anonymously. The informed consent obtained from study participants was written. A consent form was attached to the questionnaire. All questionnaires and study materials were kept in a secured cabinet in the principal investigator's office.

Data collection and procedures

Data was collected from March 1st to May 30th, 2019. Permission was also obtained from the Malls administration. The participants were approached in the work setting and the questionnaire was distributed at the end of the work. The researchers and the administration decided when and how to approach possible participants. Participants were informed about the purposes of the study. The informed consent obtained from study participants was written. They were provided with the questionnaire along with a cover letter.

Data analysis

The data were coded using the SPSS version 21 (SPSS, Inc., Chicago, IL, USA). Data were screened for missing data and outliers. No missing values and outliers were found. To meet the study aim, descriptive statistics was applied to data.

Results

Demographic data

A total of 250 questionnaires were distributed; 207 (82.8%) were returned. The features of the participants are displayed in (Table 1).

CPR and AED training status

The majority of 157 (75.8%) participants reported having received no training about CPR. The mainstream of the participants stated that they received training through accredited CPR course (9.7%). However, 197 (95.2%) of the participants reported having received no training about AED. As well as, the AED device is not available in all working areas, with (14%) of the participants stated that they had previously witnessed sudden cardiac arrest as described in (Table 1).

Knowledge about CPR and AED

In Table 2, the top misconceptions (fallacies) about the knowledge of adult CPR & AED among participants are presented. It is clear that participants' most common misconceptions are not limited only to one aspect of CPR performance or AED, but fall into all main categories: the compression - ventilation ratio (90.8%), the adult compression rate (92.8%), the adult compression depth (84.5%), the hand placement in adult CPR (75.8%), and the universal steps of AED operation (92.3%).

Discussion

This study aimed to assess the current status of CPR & AED knowledge among laypersons in Saudi Arabia. The findings of the study showed that the majority of the participants have a secondary level of

education, and the rate of participants who received no CPR training was displayed to be 75.8%. As well as, the participants who received no AED training were found to be 95.2% as shown in (Table 1).

Different countries have conducted several studies in their societies to assess the knowledge and awareness regarding CPR & AED utilization [6, 14, 20–26]. CPR training rates in other countries were as follows: in the western region at Jeddah in Saudi Arabia (28.7%) [6], and similar rate (29%) in Jordan [21]. Additionally, (21%) in Hong Kong [24], (35%) in Japan [14], (74%) in New Zealand [26], (75%) in Poland [27], (79.3%) in Washington [25], (68%) in Australia [23], in Sweden (45%) [22], and (40.3%) in Turkey [20]. This can be explained by the fact that it's obligatory to have CPR training by the Law of Occupational Health and Safety in these countries [6, 14, 20–25].

However, in Saudi Arabia, the results indicated that CPR & AED training might be primarily occurring informally as evidenced in table 1, and that the (14 %) of participants stated that they had previously witnessed sudden cardiac arrest. Similarly, (15.8%) at Jeddah in Saudi Arabia [6], (18.6%) in Turkey [20], (19%) in Japan [14], and (23.3%) in Jordan [21]. This can be explained by the fact that the participants are hesitant to apply CPR & AED universal steps since they don't have enough knowledge to perform CPR & AED effectively [6]. They are also afraid to make a mistake particularly with no AED device available in their workplace [19]. Many studies explained that poor availability, adequacy, distribution of AED, and training might be major factors that stand before the OHCA high mortality rate [5, 6, 14, 21].

Quality of CPR concepts were evaluated; compression depth and rates and hand placement. The rates were found to be significantly higher in participants who received CPR training than in those who did not received CPR training. The results indicated that the participants held a considerable number of misconceptions about CPR & AED utilization, and they had insufficient knowledge about the core, and principles of CPR & AED universal operation steps. These results are partially consistent with previous studies in regard to poor knowledge of CPR & AED utilization [5, 6, 20, 21, 24, 26, 28]. However, some aspects were different in Saudi Arabia. This might refer to the status of CPR & AED utilization, and the structured community safety programs for CPR & AED awareness and public access are not available in Saudi Arabia. On top, CPR & AED services are limited to some hospitals as training courses. Further research to examine the availability, adequacy, distribution, and need of CPR & AED training in Saudi Arabia are strongly recommended. Another explanation for the poor knowledge of CPR & AED could be the lack of education content about it in school and college curricula. However, in other countries it is obligatory to have CPR & AED courses before driving license and they are integrated into secondary schools curricula in some countries such as Austria, Japan, Norway, Hong Kong and Singapore [14, 20, 23–25].

Limitations

Considering the importance of the studied issue, the study involved a small sample of laypersons from seven malls only, and the findings may not be representative of the status of CPR & AED knowledge among laypersons in other settings. Also, the use of a self-report questionnaire could introduce bias, in

that participants might not always give full descriptions of their CPR & AED training experience. As well, this study was limited to one area located in the Eastern Province of Saudi Arabia, which limits the external validity of the findings. Future research should include additional studies with a larger sample size recruited from other community settings such as airports, mosques and football stadiums. More descriptive studies are still needed to gain a comprehensive understanding of the outcomes of CPR & AED training in Saudi community settings. This is an important step before moving to interventional studies. Polit & Beck, in (2010) advised that interventions often fail because they are designed without an adequate understanding of the problem and the relationship between variables [29].

Conclusions

The results of this study show that participants have insufficient knowledge about adult CPR & AED universal operation steps. The knowledge and awareness level of CPR and utilization of AED among adults in the public settings can be increased by generalizing CPR & AED training to the public; by this means, the rate of witnesses who start CPR can be raised. Repeating this training at certain intervals will reinforce CPR & AED training in the public settings. Moreover, this study indicates the importance of continuing training the laypersons about CPR & AED universal operation steps.

The media can play a vital role in increasing the knowledge of the public. Thus, the authors promoting the training programs in the media, utilizing cheap and effective technologies such as social media to reach the general population. The common communication instruments in today's world must be developed to contribute to standard CPR education by providing more formal instructions through schools and universities curricula. In addition, national laws should support CPR & AED training in the public settings such as airports, mosques and football stadiums. Thus, the study results indicated that it is the stakeholders' responsibility to improve the public awareness of CPR and the effective utilization of AED. More descriptive studies are still needed to gain a comprehensive understanding of the quality of CPR and the effective utilization of AED in the public settings. All of that have to be supported with an effective practical system to enhance public safety and maximize the survival rate.

Abbreviations

OHCA: Out-of-Hospital Cardiac Arrest; CPR: Cardiopulmonary Resuscitation; AED: Automated External Defibrillator; AHA: American Heart Association; EMS: Emergency Medical Services; WHO: World Health Organization; ECC: Emergency Cardiovascular Care; PAD: Public Access Defibrillation; IRB: Institutional Review Board.

Declarations

Ethics approval and consent to participate

This study was approved by the IRB of Imam Abdulrahman Bin Faisal University, Dammam,, Saudi Arabia (Reference number: IRB –2019–03–155). The informed consent obtained from study participants was written and attached to the questionnaire.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Authors' contributions

All authors have made significant contributions to this study and have approved the final version of this manuscript. SA was responsible for the study conceptualization and design, literature review, data analysis, and manuscript development. OK was responsible for the literature review, data analysis, and manuscript development. MK & MA were responsible for the data analysis and manuscript development. FMA, FSA, HA were responsible for the data collection and manuscript development. H.E & MAA were responsible for the manuscript development. AA, MSA, SHA were responsible for the literature review and manuscript development.

Acknowledgements

The authors would like to acknowledge all individuals who participated in this study. We would also like to thank Imam Abdulrahman Bin Faisal University, for supporting us in this research.

References

- [1].World Health O. World Health Statistics, 2018: Monitoring Health for the SDGs, Sustainable Development Goals;2018 IIS 4640-S2;ISBN 978–92–4–156558–5 (Internet). 2018. Contract No.: Report. Available from: <https://apps.who.int/iris/bitstream/handle/10665/272596/9789241565585-eng.pdf?ua=1>.
- [2].Wong CX, Brown A, Lau DH, Chugh SS, Albert CM, Kalman JM, et al. Epidemiology of Sudden Cardiac Death: Global and Regional Perspectives. *HEART LUNG CIRC*. 2019;28(1):6–14. doi: 10.1016/j.hlc.2018.08.026.
- [3].Benjamin EJ, Muntner P, Alonso A, Bittencourt MS, Callaway CW, Carson AP, et al. Heart Disease and Stroke Statistics—2019 Update: A Report From the American Heart Association. *CIRC J*. 2019;139(10):e56-e66. doi:10.1161/CIR.0000000000000659.
- [4].World Health O. World Health Organization - Noncommunicable Diseases (NCD) Country Profiles, 2018. 2018. Available from: https://www.who.int/nmh/countries/sau_en.pdf.
- [5].Bin Salleeh H, Gabralla K, Leggio W, Al Aseri Z. Out-of-hospital adult cardiac arrests in a university hospital in central Saudi Arabia. *SAUDI MED J*. 2015;36(9):1071–5. doi:10.15537/smj.2015.9.12081.
- [6].Qara FJ, Alsulimani LK, Fakeeh MM, Bokhary DH. Knowledge of Nonmedical Individuals about Cardiopulmonary Resuscitation in Case of Cardiac Arrest: A Cross-Sectional Study in the Population of Jeddah, Saudi Arabia. *EMERG MED INT*. 2019;2019:1–11. doi:10.1155/2019/3686202.
- [7].Mgbako OU, Ha YP, Ranard BL, Hypolite KA, Sellers AM, Nadkarni LD, et al. Defibrillation in the movies: A missed opportunity for public health education. *RESUSCITATION*. 2014;85(12):1795–8. doi:10.1016/j.resuscitation.2014.09.005.
- [8].Neumar RW. Doubling Cardiac Arrest Survival by 2020: Achieving the American Heart Association Impact Goal. *CIRC J*. 2016;134(25):2037–9. doi: 10.1161/CIRCULATIONAHA.116.025819.
- [9].Hasselqvist-Ax I, Riva G, Herlitz J, Rosenqvist M, Hollenberg J, Nordberg P, et al. Early Cardiopulmonary Resuscitation in Out-of-Hospital Cardiac Arrest. *NEW ENGL J MED*. 2015;372(24):2307–15. doi:10.1056/NEJMoa1405796.
- [10].Kleinman ME, Brennan EE, Goldberger ZD, Swor RA, Terry M, Bobrow BJ, et al. Part 5: Adult Basic Life Support and Cardiopulmonary Resuscitation Quality: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *CIRC J*. 2015;132(18_suppl_2 Suppl 2):S414-S35. doi:10.1161/CIR.0000000000000259.
- [11].Kleinman ME, Goldberger ZD, Rea T, Swor RA, Bobrow BJ, Brennan EE, et al. 2017 American Heart Association Focused Update on Adult Basic Life Support and Cardiopulmonary Resuscitation Quality: An Update to the American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *CIRC J*. 2018;137(1):e7-e13. doi:10.1161/CIR.0000000000000539.

- [12].Page RL. The AED in resuscitation: it's not just about the shock. TRANS AM CLIN CLIMATOL ASSOC. 2011;122:347. Available from:
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3116356/pdf/tacca122000347.pdf>.
- [13].Nas J, Thannhauser J, Herrmann JJ, van der Wulp K, van Grunsven PM, van Royen N, et al. Changes in automated external defibrillator use and survival after out-of-hospital cardiac arrest in the Nijmegen area. NETH HEART J. 2018;26(12):600–5. doi:10.1007/s12471–018–1162–9.
- [14].Kuramoto N, Morimoto T, Kubota Y, Maeda Y, Seki S, Takada K, et al. Public perception of and willingness to perform bystander CPR in Japan. RESUSCITATION. 2008;79(3):475–81. doi:10.1016/j.resuscitation.2008.07.005.
- [15].Hazinski MF, American Heart A. Basic life support: provider manual. Dallas, Tex: American Heart Association; 2016.
- [16].Weisfeldt ML, Pollack RA. Public Access Defibrillation. Card Electrophysiol Clin. 2017;9(4):551–7. doi:10.1016/j.ccep.2017.07.006.
- [17].Sidebottom DB, Potter R, Newitt LK, Hodgetts GA, Deakin CD. Saving lives with public access defibrillation: A deadly game of hide and seek. RESUSCITATION. 2018;128:93–6. doi:10.1016/j.resuscitation.2018.04.006.
- [18].Hansen CM, Lippert FK, Wissenberg M, Weeke P, Zinckernagel L, Ruwald MH, et al. Temporal Trends in Coverage of Historical Cardiac Arrests Using a Volunteer-Based Network of Automated External Defibrillators Accessible to Laypersons and Emergency Dispatch Centers. CIRC J. 2014;130(21):1859–67. doi:10.1161/CIRCULATIONAHA.114.008850.
- [19].Zinckernagel L, Hansen CM, Rod MH, Folke F, Torp-Pedersen C, Tjørnhøj-Thomsen T. A qualitative study to identify barriers to deployment and student training in the use of automated external defibrillators in schools. BMC Emerg. Med.. 2017;17(1):3. doi:10.1186/s12873–017–0114–9.
- [20].Özbilgin S, Akan M, Hanci V, Aygün C, Kuvaki B. Evaluation of Public Awareness, Knowledge and Attitudes about Cardiopulmonary Resuscitation: Report of Izmir. Turk J Anaesth Reanim. 2015;43(6):396. doi:10.5152/TJAR.2015.61587.
- [21].Jarrah S, Judeh M, AbuRuz ME. Evaluation of public awareness, knowledge and attitudes towards basic life support: a cross-sectional study. BMC Emerg. Med.. 2018;18(1):1–7. doi:10.1186/s12873–018–0190–5.
- [22].Axelsson ÅB, Herlitz J, Holmberg S, Thorén A-B. A nationwide survey of CPR training in Sweden: Foreign born and unemployed are not reached by training programmes. RESUSCITATION. 2006;70(1):90–7. doi:10.1016/j.resuscitation.2005.11.009.

- [23].Bray JE, Smith K, Case R, Cartledge S, Straney L, Finn J. Public cardiopulmonary resuscitation training rates and awareness of hands-only cardiopulmonary resuscitation: a cross-sectional survey of Victorians: CPR TRAINING AND AWARENESS OF HANDS-ONLY CPR. EMERG MED AUSTRALAS. 2017;29(2):158–64. doi:10.1111/1742–6723.12720.
- [24].Chair SY, Hung MSY, Lui JCZ, Lee DTF, Shiu IYC, Choi KC, et al. Public knowledge and attitudes towards cardiopulmonary resuscitation in Hong Kong: telephone survey. HONG KONG MED J = Xianggang yi xue za zhi. 2014;20(2):126–33. doi:10.12809/hkmj134076.
- [25].Sipsma K, Stubbs BA, Plorde M. Training rates and willingness to perform CPR in King County, Washington: A community survey. RESUSCITATION. 2010;82(5):564–7. doi:10.1016/j.resuscitation.2010.12.007.
- [26].Larsen PD, Pearson J, Galletly D. Knowledge and attitudes towards cardiopulmonary resuscitation in the community. N Z Med J. 2004;117(1193):8p. Retrieved from <https://library.iau.edu.sa/docview/1033756258?accountid=136546>.
- [27].Rasmus A, Czekajlo MS. A national survey of the Polish population's cardiopulmonary resuscitation knowledge. EUR J EMERG MED. 2000;7(1):39–43. doi:10.1097/00063110–200003000–00008.
- [28].Jennings S, Hara TO, Cavanagh B, Bennett K. A national survey of prevalence of cardiopulmonary resuscitation training and knowledge of the emergency number in Ireland. RESUSCITATION. 2009;80(9):1039–42. doi:10.1016/j.resuscitation.2009.05.023.
- [29].Polit DF, Beck CT. Essentials of nursing research: appraising evidence for nursing practice. 7th ed. Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2010.

Tables

TABLE 1. The demographic features of the participants

Characteristics	Result
Age	
	Mean 32.60 years (SD 10.02)
Gender	
Male	178 (86%)
Female	29 (14%)
Level of education	
Less than secondary education	56 (27.1%)
Secondary education	111 (53.6%)
College education	21 (10.1%)
University education	19 (9.2%)
Job title	
Administrator	27 (13%)
Security personnel	180 (87%)
Receive any training covering CPR	
Yes	50 (24.2%)
No	157 (75.8%)
Receive any training covering AED	
Yes	10 (4.8%)
No	197 (95.2%)
Source of CPR and AED training	
Web/computer	4 (1.9%)
Accredited CPR course	20 (9.7%)
Training books/written materials	1 (0.5%)
Video presentation	1 (0.5%)
Didactic lecture	8 (3.9%)
Internal institute training	16 (7.7%)
Witness cardiac arrest cases while working	
Yes	22 (14%)
No	178 (86%)
AED device availability in workplace	
Yes	0 (0%)
No	207 (100%)

SD = Standard Deviation; CPR = Cardiopulmonary Resuscitation; AED = Automated External Defibrillator

TABLE 2. Descriptive results of participant's answers on the knowledge of adult CPR & AED

Item	Question	Item participants answers	
		Correct Frequency (%)	Wrong Frequency (%)
1	The EMS number in Saudi Arabia is? (T^B) A. 996 B. 997	95(45.9)	112(54.1)
2	The adult compression - ventilation ratio for 1 or 2 rescuers is? (T^B) A. 15:2 B. 30:2	19(9.2)	188(90.8)
3	The adult compression rate is? (T^B) A. 80 – 100 / min B. 100 – 120 / min	15(7.2)	192(92.8)
4	The adult compression depth is? (T^A) A. At least 2 inches (5 cm) B. less than 2 inches (5 cm)	32(15.5)	175(84.5)
5	The hand placement in adult CPR is? (T^A) A. Two hands on the lower half of the breastbone (sternum) B. Two hands on the middle of the breastbone (sternum)	50(24.2)	157(75.8)
6	When the AED device arrives, what should you do next? (T^B) A. Attach pads, power on, analyzing and follow AED Prompts. B. Power on, attach pads, analyzing and follow AED Prompts.	16(7.7)	191(92.3)

EMS = Emergency Medical Services; T^A = True choice A; T^B = True choice B; CPR = Cardiopulmonary Resuscitation; AED = Automated External Defibrillator