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Original Research Paper

The Effect of Cardiopulmonary Resuscitation Education With SIKOMJARU Media on Compression Quality in Lay Community

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Abstract

Background: Cardiac arrest is an emergency condition requiring rapid treatment, and cardiopulmonary resuscitation skills are essential to improve the victim's chances of survival. **Objective**: This study aims to evaluate the effect of cardiopulmonary resuscitation education using SIKOMJARU media on compression quality in lay people in Kalisaleh village, Pemalang district. **Methods**: The method used was pre-experimental with a one group pretest and posttest design approach, involving 40 respondents from the local community. Before the intervention, respondents showed low understanding and skills in performing chest compressions. After receiving education and training using SIKOMJARU media, respondents practiced CPR techniques better. **Results**: The analysis results showed a significant improvement in compression quality, with a p value <0.05, indicating the effectiveness of SIKOMJARU media in improving respondents' knowledge and skills. **Conclusion**: The conclusion of this study is that cardiopulmonary resuscitation education with SIKOMJARU media can improve the community's ability to provide first aid to cardiac arrest victims, thus expected to contribute to increasing survival rates among these communities.

Keywords: *CPR Education, SIKOMJARU Media, Compression Quality*.

Introduction

Emergency conditions are sudden situations requiring immediate action. Emergencies can occur anywhere and anytime. Cardiac arrest events can lead to death if not handled quickly[1].

Cardiac arrest is the most common problem in emergency department patients. It is also one of the most common fatal diseases worldwide. Cardiac arrest is a disorder and loss of heart function quality, often characterized by unpalpable carotid pulse, absence of breathing, and decreased consciousness[2].

Out-of-Hospital Cardiac Arrest (OHCA) is often a fatal condition. In several countries, OHCA cases are increasing. According to the American Heart Association (AHA) 2013 report in "The Heart Disease and Stroke Statistics," there were 359,400 OHCA cases in the United States. Overall, 40.1% of victims received Cardiopulmonary Resuscitation (CPR) from bystanders, with a 9.5% survival rate for those receiving CPR at the scene[3].

There is no accurate information about how many people in Indonesia experience cardiac arrest in daily life or outside hospitals, but it's estimated around 10,000 people per year, meaning 30 people per day. Often, people with coronary heart disease become victims. This is estimated to increase to 23.3 million deaths by 2030[4].

Deaths from cardiac arrest can be prevented, and first aid is crucial to sustaining life. When someone experiences cardiac arrest, the 7-10 minute window is the best time to save

them. Without timely help within the first minutes, many people do not survive due to delayed assistance. Each minute in this period carries risk, with some cases resulting in death due to minimal assistance. Cardiac arrest survival decreases by 7-10% per minute. Delayed first aid hinders brain oxygenation, eventually leading to brain cell death[5].

Cardiopulmonary Resuscitation (CPR) is vital for saving lives as it can restore breathing and circulation in cardiac arrest victims. Performing CPR is part of Basic Life Support (BLS). BLS is a systematic method for evaluating emergency responses[6]. The competence of laypersons in handling and performing CPR skills such as knowing proper chest compression location, timing, depth, and speed is essential. Since OHCA increases mortality, this has become a major problem requiring rapid resolution[7].

The 2018 American Heart Association update recommends that adults with suspected OHCA receive hands-only CPR (chest compressions only). AHA also states that untrained laypersons should perform hands-only CPR without healthcare provider instructions. However, trained laypersons are advised to perform conventional CPR with chest compressions and ventilation (rescue breathing)[8].

In Indonesia, CPR training programs are being developed. However, current CPR training primarily targets health institutions. Few programs target lay communities. CPR requires manikins; this study uses the innovative SIKOMJARU manikin (Cardiopulmonary Resuscitation Education Manikin). SIKOMJARU is developed from the PREJARU manikin (Cardiopulmonary Resuscitation Innovation Manikin). PREJARU is a health education medium classified as non-projected visual aids. SIKOMJARU and PREJARU similarities include both being usable for CPR training and three-dimensional health education teaching aids[9].

This research contributes novelty in understanding technology-based education media effectiveness in improving compression quality in CPR among lay communities. The SIKOMJARU manikin is innovative with immediate detection capabilities for correct/incorrect CPR performance through indicator lights blue when compression depth is correct (5-6 cm) equipped with a metronome speaker to measure speed (100-120 compressions/minute) and a speaker for CPR Hands-Only Standard Operating Procedures (SOP) per 2020 AHA guidelines. When CPR activities don't meet depth/speed standards, indicator lights turn red. Using SIKOMJARU helps students and the general public understand proper compression techniques and serves as a tool for practicing CPR, enabling emergency health services during community cardiac/respiratory arrest incidents.

Based on preliminary study results and interviews with 10 Kalisaleh villagers, 90% of the community lacks Basic Life Support (BLS) knowledge and doesn't know what first aid to provide when encountering cardiac arrest victims before medical help arrives. First aid provided by the community to cardiac arrest victims is expected to deliver initial assistance and increase survival chances. With high heart disease prevalence and significant cardiac arrest mortality rates, this research is relevant for providing solutions through improving community knowledge and skills in performing CPR[10].

Lack of community knowledge in emergency response necessitates examining factors influencing BLS knowledge, such as education level, age, environmental factors, and socio-cultural factors[11]. One effort to improve knowledge is through socialization, education, and various information media to enhance BLS understanding.

Poor CPR compression quality affects victim survival. Laypersons, often first responders in emergencies, tend to lack

sufficient skills for effective cardiac compressions. Therefore, effective education is crucial to ensure CPR can be performed correctly from the first moments. By utilizing education media like SIKOMJARU designed for clear knowledge and direct practice layperson CPR compression quality is expected to improve, subsequently reducing cardiac arrest mortality. Many laypersons don't know how to perform CPR correctly, which can be fatal in emergencies. Thus, this study aims to determine the effect of CPR education with SIKOMJARU media on compression quality in lay communities and to assess respondents' knowledge and skill levels before and after CPR education using SIKOMJARU, as effective education can increase cardiac arrest victims' survival chances.

Based on the above, the researchers are interested in studying "The Effect of Cardiopulmonary Resuscitation Education With SIKOMJARU Media on Compression Quality in Lay Community." It is hoped the results will contribute to developing better CPR training methods and improve community ability to perform correct and effective chest compressions.

Materials and Methods

Study Design

This study used quantitative research with a pre-experimental design. The research design employed a One Group Pretest-Posttest Design to compare conditions before and after intervention.

Sample

The population was 40 people from Kalisaleh village, Pemalang Regency, attending Basic Life Support (BLS) education sessions. The sampling technique used total sampling. The independent variable was the effect of CPR education with SIKOMJARU media, while the dependent variable was compression quality. The research instrument used observation sheets, referring to established standards based on American Heart Association (2020) CPR Standard Operating Procedures (SOP) and modified with Indonesian National Nurses Association (PPNI) SOPs, categorized into three levels: good, adequate, and poor.

Data Collection Techniques

The study was conducted in three stages: first, pre-test using observation sheets filled by researchers as respondents performed CPR per American Heart Association (2020) and PPNI guidelines before intervention. Second, intervention through CPR or BLS education. Finally, after intervention, respondents again performed CPR per AHA (2020) and PPNI guidelines. SIKOMJARU underwent product feasibility testing by nursing academics and emergency nursing specialists.

Data Analysis Techniques

Data analysis to examine the effect of CPR education with SIKOMJARU media on compression quality used univariate analysis to collect respondent characteristics (age, gender, education level). Bivariate analysis used the Wilcoxon test, determined by normality test results. The Wilcoxon test assessed health education's effect on first aid knowledge for cardiac arrest cases by the community.

Ethical Consideration

This study met ethical guidelines set by the Research Ethics Committee (KEPK) at Universitas Muhammadiyah Purwokerto with ethics code KEPK/UMP/68/X/2024. All respondents received information about the study's purpose and benefits and voluntarily participated by signing informed consent.

Result

This section presents research results on the effect of CPR education with SIKOMJARU media on compression quality in lay communities. Results were analyzed and

presented through univariate and bivariate analyses as follows:

Table 1. Frequency Distribution of Respondent Characteristics Based on Age, Gender, and Education Level in Lay Community (n=40)

Characteristic	Frequency	Percentage
Age		
26-35 years	8	20.0
36-45 years	21	52.5
46-55 years	11	27.5
Gender		
Male	14	35.0
Female	26	65.0
Education Level		
Elementary School (SD)	10	25.0
Junior High (SMP)	11	27.5
Senior High (SMA/SMK)	17	42.5
University (S1)	2	5.0

Table 1 shows age distribution: 26-35 years (20%), 36-45 years (52.5%), and 46-55 years (27.5%). Total respondents were 40, with the majority in the 36-45 age group. Gender characteristics show females predominated (26 people, 65%) versus males (14 people, 35%). Education level characteristics show most respondents had SMA/SMK education (42.5%), followed by SMP (27.5%), SD (25.0%), and few with S1 education (5.0%).

Table 2 shows Wilcoxon test results for CPR education effect with SIKOMJARU media on compression quality in lay communities. Among 40 respondents, pre-test median was 3, while post-test median was 9. Statistical analysis yielded p=0.001 <0.05, indicating significant difference between post-test and pre-test scores. Thus, "Ha is accepted," concluding that CPR education with SIKOMJARU media significantly affects compression quality in lay communities. However, the Z-value of -5.600 exceeds typical abnormal distribution thresholds, though this doesn't directly impact overall result significance.

Table 2. Analysis of CPR Education Effect With SIKOMJARU Media on Compression Quality in Lay Community (n=40)

Compression Quality	n	Median	Min-Max	Z	p
Pre Test	40	3.00	2-4	-5.600	0.001
Post Test	40	9.00	8-10		

Discussion

Cardiopulmonary Resuscitation (CPR) is critical for saving lives in cardiac arrest cases. Effective CPR education can improve laypersons' knowledge and skills in performing hands-only CPR correctly. This study aligns with Growth et al (2022)[12], stating that education or health promotion is an action that can improve knowledge and behavior of individuals, groups, or communities, supporting habits, attitudes, and knowledge in taking health-related actions.

Based on research with 40 respondents, most were aged 36-45 years (productive age group). According to Ardiansyah (2019)[13], age affects compression quality in CPR, as younger individuals have better muscle strength and stamina for effective compressions. Fikriana (2016)[14] showed better compression quality in respondents aged 26-35 compared to >45 years due to muscle strength and stamina loss with age.

Gender characteristics showed females predominated (65%) versus males (35%). According to Widya Addiarto (2021)[15], there's a significant correlation between gender and compression quality, with females showing lower quality due to higher overweight prevalence and faster fatigue. To evaluate gender, body mass index, and physical effort level relationships with compression quality, this study used Spearman rank, showing

positive correlation (p ≤0.05). To maintain compression quality, female practitioners should periodically change CPR performers to prevent rapid fatigue, thus maintaining adequate compression speed and quality.

Education level characteristics: SD (25%), SMP (27.5%), SMA/SMK (42.5%), and S1 (5.0%). SMA/SMK had the highest proportion, showing greater potential to understand CPR education instructions. However, improving overall compression quality requires ensuring equal access to effective education across all education levels. Recent studies show continuous training and realistic simulations significantly impact compression quality. For example, Sulistyanto et al (2023)[16] showed that per 2020 AHA recommendations, social worker staff CPR quality was very good. Other studies emphasize continuous training importance to ensure communities can provide rapid, accurate interventions in emergencies like cardiac arrest[17].

Previous research showed most people don't know how to perform CPR. According to Masruri (2021)[18], before education, respondents' CPR knowledge averaged 12.00 with 1.4611 variation, indicating relatively low pre-intervention knowledge. Community knowledge and skills significantly improved post-intervention. In one study, median knowledge increased to 16.00 post-education with lower variation (0.716), showing more even and higher knowledge distribution. Most respondents performed chest compressions more precisely through observation, indicating significant compression skill improvement[19].

This study explored CPR education effects using SIKOMJARU media on compression quality in Kalisaleh village's lay community. In emergencies, knowing how to perform hands-only CPR correctly is crucial[20]. Here, 40 respondents underwent training designed to improve chest compression skills. Wilcoxon analysis showed education successfully improved compression quality (Z=-5.600, p=0.001 <0.05), confirming significant pre-test/post-test score differences. These results align with Adhi et al (2024)[7], using Digital Resuscitation Pad to help intervention groups learn CPR simulation. This device measures mandible-to-sternum-midpoint distance to determine chest compression location. Their study found 56.52% in the control group performed inaccurate compressions (26 respondents, over half). After Digital Resuscitation Pad intervention, compression quality improved to 86.95% (29 respondents with quality compressions).

According to Endiyono (2018)[21], pre-training respondent skill averaged 2.83 ±0.950 (Z=-4.684, p=0.0001 <0.05). Pre-training knowledge averaged 4.87 ±2.129, increasing to 7.33 ±2.090 post-training. Wilcoxon bivariate analysis showed BLS knowledge and skills in MDMC Banyumas TIM were influenced by BLS training. Wahyuningsih et al (2022)[22] also showed CPR education with demonstration models significantly improved participant knowledge and skills. Post-intervention, nearly all respondents showed improved CPR ability (p <0.05). This case indicates interactive education and direct practice can improve community emergency response capabilities.

Additionally, Ashar (2022)[23] supports these findings, showing demonstration methods in CPR training significantly improved participant knowledge. In that study, knowledge scores increased from 69.23 pre-test to 77.79 post-intervention. Another study by Wenny Rasmawati Simamora et al (2023)[24] emphasized simulation-based training importance in maintaining CPR skills among communities. They reported that visual aids and direct practice yielded better results (p<0.05), indicating significant health education effects on respondent abilities and skills.

Overall, this study shows CPR education with SIKOMJARU media significantly improved compression quality in lay

communities (p=0.001) from post-test results after SIKOMJARU manikin intervention. Findings demonstrate SIKOMJARU-based CPR education not only improves layperson compression quality but also aligns with current literature supporting interactive education methods in improving first aid skills for cardiac arrest victims. Therefore, this method is highly recommended to enhance community readiness in handling emergencies like cardiac arrest. SIKOMJARU-based education is a strategic step to minimize cardiac arrest mortality and increase public awareness about hands-only CPR importance. Thus, this research has potential to significantly contribute to public health and emergency care fields.

Conclusion

This study shows CPR education with SIKOMJARU media significantly improved respondents' compression quality. This was evidenced by observation score differences before and after CPR education intervention with SIKOMJARU media (P=0.001). Respondents showed improvement in crucial aspects like chest compression technique, indicated by blue lights showing good compression quality during each compression. With most respondents in productive age groups and relatively good education levels, this provides great opportunity to improve community CPR knowledge and skills. Overall, SIKOMJARU media proved effective as an information and practice tool for CPR education in lay communities, making it suitable for health education programs.

Recommendations for future research include conducting similar studies in diverse regions with different characteristics to evaluate SIKOMJARU media effectiveness in broader contexts. This could help understand if results are consistent across populations. Additional variables like anxiety levels or respondent motivation before/after education could be added to examine how these factors affect compression quality, providing deeper insights into education success factors.

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