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Original Article

Bystander alertness, responsiveness, and barriers to providing first aid for sudden cardiac arrest in Indonesia: A preliminary community-based study

Yohanes K. Windi[1*], Loetfia D. Rahariyani[1], Nikmatul Fadilah[1] and Eko R. Wiyatno[1]

[1]Department of Nursing, Poltekkes Kemenkes Surabaya, Surabaya, Indonesia

*Corresponding author: windi.yohanes@poltekkes-surabaya.ac.id

Abstract

Bystanders can play a critical role in improving survival after sudden cardiac arrest (SCA), yet hesitation and inaction remain common. The aim of this study was to assess bystander alertness, responsiveness, and barriers to providing first aid for SCA in an Indonesian community setting. A cross-sectional survey was conducted among 500 residents attending four Community Health Centers in Sidoarjo District, East Java, Indonesia. A structured, self-administered questionnaire assessed recognition of heart disease, perceptions of life-threatening cardiac conditions, intended responses to SCA, types of medical aid sought, reasons for not providing first aid, and specific first-aid actions. Data were analyzed using descriptive statistics and Chi-squared tests. Overall, respondents showed limited recognition of SCA as a distinct cardiac emergency and were more familiar with heart attack and coronary disease. Although SCA is highly time-critical, it was not commonly perceived as the most life-threatening heart condition. Most respondents preferred to seek medical help rather than provide immediate first aid, while direct bystander intervention was uncommon. Among those who would not intervene, fear of being blamed, lack of knowledge, and perceived incompetence were the main barriers. Among respondents willing to help, intended actions were more commonly directed toward waking the victim or using culturally familiar practices, whereas cardiopulmonary resuscitation (CPR) was rarely reported. Significant differences were observed across all assessed response domains ($p<0.001$). These findings indicate low community alertness and responsiveness to SCA in this Indonesian setting. Community-based SCA education, hands-only CPR training, clearer emergency response guidance, and culturally sensitive public messaging are needed to improve bystander readiness and reduce delays in first aid.

Keywords: Bystanders, alertness, responsiveness, barriers, first-aid

Introduction

Sudden cardiac arrest (SCA) is a life-threatening condition in which the heart abruptly ceases effective mechanical activity, causing loss of consciousness, absent breathing, and absent pulse. Without prompt intervention, death occurs within minutes. The “golden period” for resuscitation is approximately ten minutes, yet survival rates drop by 7–10% with every single minute without defibrillation or high-quality cardiopulmonary resuscitation (CPR) [1]. Globally, out-of-hospital SCA (OHCA) carries a dismal prognosis. The American Heart Association reported that 90% of OHCA cases end fatally, and even in high-resource settings, survival to hospital discharge rarely

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exceeds 10–12% [1]. SCA incidence rates range from 40 per 100,000 annually in Asia to 67–170 per 100,000 in Europe and 102.5 per 100,000 in Australia and New Zealand [2-5]. In Indonesia, national SCA data remain poorly documented, underlining broader gaps in SCA emergency surveillance and public health prioritization.

Crucially, most SCA events occur outside hospitals—70% at home, 18% in public places or workplaces, and 11% in nursing homes [1,6,7]. Consequently, lay people such as family members, coworkers, or bystanders—who are often the first to witness SCA—need to be highly alert and able to provide first aid before medical or emergency personnel arrive at the scene. Rapid recognition of SCA signs or symptoms and prompt action, particularly immediate CPR and use of an automated external defibrillator, can double or triple survival rates [8,9]. The international survival framework emphasizes early recognition, early CPR, early defibrillation, and advanced life support, with bystanders playing a critical initial role. Despite this potential, bystander intervention rates remain suboptimal worldwide, ranging from 20% to 60% across countries and settings [10].

Some barriers may hamper the first-aid response to SCA, and they can be physical, psychological, systemic, or communication-related barriers. Common barriers documented in high-income countries include confusion about what actions to take, fear of harming the victim, lack of training, fear of legal liability despite the presence of Good Samaritan laws, diffusion of responsibility known as the bystander effect, and disgust or fear of infection [11,12]. In low- and middle-income countries, including Indonesia, these barriers are aggravated by weaker emergency medical services infrastructure, lower population-level CPR training rates, ambiguous legal protections, and the persistence of indigenous healing practices that may delay or replace evidence-based interventions. Those barriers, in turn, reduce bystander responsiveness to administering first aid. In Indonesia, research on bystander behavior in SCA is practically limited. Most emergency care studies focus on healthcare professionals, disaster task forces, or in-hospital cardiac arrest. The role of lay first responders is rarely highlighted, especially when they refuse to act due to poor recognition of the disease, fear of making mistakes, or fear of worsening the victim's condition. In addition, cultural practices such as applying menthol-based aromatherapy ointments to the nostrils of unconscious individuals are commonly used to manage fainting. However, such practices are ineffective in cases of SCA and may dangerously delay appropriate lifesaving care. Recognizing these context-specific barriers is essential for designing effective public health interventions. The aim of this study was therefore to assess bystander alertness, barriers, and responsiveness regarding providing first aid for SCA in Indonesia. The findings are expected to inform targeted educational and promotional initiatives, policy recommendations, and training programs tailored to the Indonesian sociocultural context.

Methods

Study design and setting

A cross-sectional preliminary study was conducted from May to July 2023 in four Community Health Centers (CHCs or *Puskesmas*) of Sukodono, Gedangan, Buduran, and Tanggulangin in Sidoarjo District, East Java Province, Indonesia. Sidoarjo is a densely populated peri-urban district adjacent to Surabaya, Indonesia's second-largest city, with a population of approximately 2.2 million [13]. The district has a mix of urban and rural areas, with varying access to emergency services. CHCs serve as primary point of routine outpatient care for most residents. CHCs were selected as practical recruitment sites because they are commonly used by local residents for routine outpatient care.

Participants and criteria

The target population was adult residents (≥18 years) attending outpatient services at the selected CHCs for non-emergency care. Eligible participants were individuals aged ≥18 years, able to provide written informed consent, and who had resided in Sidoarjo District for at least 6 months. Individuals were excluded if they were experiencing an acute medical emergency at the time of enrolment, had cognitive impairment that precluded questionnaire completion (e.g., dementia or

severe intellectual disability), or had received healthcare professional training to avoid overestimation of knowledge.

Sample size and sampling

Participants were recruited using purposive sampling. Before data collection, the patients' registration records showed that approximately 500 residents visited each CHC, resulting in an estimated total population of approximately 2,000 visitors across the four CHCs. Using Raosoft's sample size calculator, with a 95% confidence level and a 5% margin of error, the minimum required sample size was 323 participants. To improve precision and support subgroup analyses, 500 participants were recruited, with 125 respondents from each CHC.

Study instrument

A structured, self-administered questionnaire was developed in Bahasa Indonesia by the research team based on a literature review and expert consultation involving two emergency nursing specialists, two public health experts, and two cardiovascular medical specialists. The questionnaire underwent pilot testing with 30 individuals from a non-participating CHC to assess clarity, readability, and cultural appropriateness. Minor wording adjustments were made. The final instrument contained six questions with a single-response format. The format allowed respondents to choose only one option, with each question assigned a score of 1. The first item examines the recognition of heart diseases (heart attack, coronary artery disease, SCA, arrhythmias, heart failure, and cardiomyopathy). The second item measures perception of the most life-threatening heart disease. The third item evaluates the intended response when witnessing a potential SCA (confused/inactive, seek medical aid, or provide first aid). The fourth item identifies the type of medical aid sought (call emergency unit, seek health staff, ask bystanders, or provide minimal first aid). The fifth item explores the reasons for not providing first aid (incompetence, fear of blame, fear of mistakes, or unfamiliarity). The final item determines the specific first aid actions if provided (resuscitation/CPR, aromatherapy ointment, back/hands/chest massage, or attempt to awaken).

Data collection

Data collection was conducted by approaching potential participants in the waiting rooms of the CHCs. The researchers explained the study aims, benefits, expected outcomes, and possible direct and indirect implications of participation. Participants who agreed to take part were asked to sign the informed consent form before completing the questionnaire. Each participant received the questionnaire along with brief instructions on how to complete it.

To reduce social desirability bias and researcher influence, participants completed the questionnaire privately in the waiting area without the presence of researchers or health staff. Researchers were available only to clarify questions and did not guide participants' responses. Completed questionnaires were placed in a designated collection box in the waiting room or handed directly to the researchers.

Data analysis

One-sample Chi-squared tests were applied to compare observed distributions against expected equal allocation across response categories. Statistical significance was set at $p<0.05$. Confidence intervals (95%) for proportions were calculated using the Wilson score method. No imputation for missing data was performed; missing responses (less than 2% for any item) were excluded listwise. Data were analyzed using SPSS version 26 (IBM Corp., Armonk, NY, USA).

Results

Respondents' characteristics

A total of 500 participants completed the questionnaire, and their characteristics are presented in **Table 1**. The sample was equally distributed across the four CHCs, with 125 participants recruited from each center. Most respondents were female (345, 69.0%); adults aged 18–44 years represented the largest age group (255, 51.0%), followed by those aged 45–59 years (159, 31.8%). Educational attainment was generally low, with most respondents having completed primary

school (171, 34.2%), junior high school (153, 30.6%), or senior high school (143, 28.6%); only 33 respondents (6.6%) had tertiary education. Nearly half of the respondents were self-employed, including farmers (241, 48.2%), followed by private-sector workers (168, 33.6%), civil servants (57, 11.4%), and unemployed participants (34, 6.8%).

Table 1. Sociodemographic characteristics of respondents included in the study (n=500)

Demographic characteristic	Frequency	Percentage (%)
Sex		
Male	155	31.0
Female	345	69.0
Age (years)		
18–44	255	51.0
45–59	159	31.8
≥60	86	17.2
Education		
Primary school	171	34.2
Junior high school	153	30.6
Senior high school	143	28.6
Tertiary education	33	6.6
Employment		
Unemployed	34	6.8
Civil servant	57	11.4
Self-employed (mostly farmers)	241	48.2
Private sectors	168	33.6

Recognition of heart diseases

Heart attack was the most widely recognized heart disease (55.6%), followed by coronary disease (35.4%) (**Table 2**). In contrast, SCA was recognized by only 2.6% of respondents. Heart failure (3.2%), arrhythmias (2.2%), and cardiomyopathy (1.0%) were also poorly recognized. Recognition of heart disease types differed significantly across categories ($p<0.001$), with heart attack being the most frequently recognized condition, followed by coronary disease, while SCA was rarely recognized (**Table 2**).

Table 2. Recognition of different heart diseases among respondents (n=500)

Heart disease type	Frequency	Percentage	95% confidence level		*p*-value
			Lower	Upper	
Heart attack	278	55.6	51.2%	59.9%	<0.001
Coronary disease	177	35.4	31.3%	39.7%	
Sudden cardiac arrest (SCA)	13	2.6	1.5%	4.3%	
Arrhythmias	11	2.2	1.2%	3.8%	
Heart failure	16	3.2	1.9%	5.0%	
Cardiomyopathy	5	1.0	0.4%	2.2%	

Perception of life-threatening heart disease

Despite SCA's high mortality rate, heart attack was more frequently perceived as the most life-threatening condition (47.6%), followed by SCA (24.4%) (**Table 3**). Coronary disease (14.6%), heart failure (10.4%), cardiomyopathy (2.2%), and arrhythmias (0.8%) were less frequently identified as the most dangerous. Perceptions of the most life-threatening heart disease differed significantly across categories ($p<0.001$), with heart attack being most frequently perceived as the most dangerous condition, followed by SCA (**Table 3**).

Table 3. Perception of the most life-threatening heart disease among respondents (n=500)

Life-threatening heart disease	Frequency	Percentage	95% confidence level		*p*-value
			Lower	Upper	
Heart attack	238	47.6	43.2%	52.0%	<0.001
Coronary diseases	73	14.6	11.7%	17.9%	
Sudden cardiac arrest (SCA)	122	24.4	20.8%	28.3%	
Arrhythmias	4	0.8	0.3%	1.9%	
Heart failure	52	10.4	8.0%	13.3%	
Cardiomyopathy	11	2.2	1.2%	3.8%	

Responses to sudden cardiac arrest (SCA) incidents

Responses to SCA incidents differed significantly across categories (p<0.001). Seeking medical aid was the most common response (54.2%), followed by being confused or doing nothing (39.8%) (**Table 4**). Only 30 respondents (6.0%) reported that they would provide first aid. These findings indicate that immediate first-aid response to SCA was very limited among respondents.

Table 4. Responses to sudden cardiac arrest (SCA) incidents among respondents (n=500)

Response to SCA	Frequency	Percentage	95% confidence level		p-value
			Lower	Upper	
Confused/doing nothing	199	39.8	35.6%	44.1%	<0.001
Seeking medical aid	271	54.2	49.8%	58.5%	
Providing first aid	30	6.0	4.2%	8.3%	

Type of medical aid sought

Among the 271 respondents who would seek medical aid, the type of help sought differed significantly across categories (p<0.001) (**Table 5**). Calling an emergency unit was the most common response (52.8%), followed by asking others for help (26.6%) and seeking health staff directly (13.3%). Only 7.4% reported that they would provide minimum first aid (**Table 5**).

Table 5. Types of medical aid sought during sudden cardiac arrest (SCA) incidents among respondents who would seek help (n=271)

Medical aid sought	Frequency	Percentage	95% confidence level		p-value
			Lower	Upper	
Call emergency unit	143	52.8	46.8%	58.7%	<0.001
Seeking health staff	36	13.3	9.6%	17.7%	
Asking for help	72	26.6	21.6%	32.1%	
Minimum first aid	20	7.4	4.7%	11.0%	

Reasons for not providing first aid

Among 199 respondents who would not intervene directly during SCA incidents, the reported barriers differed significantly across categories (p<0.001) (**Table 6**). Fear of being blamed was the most common barrier, reported by 91 respondents (45.7%), followed by lack of knowledge about minimum treatment/first aid in 56 respondents (28.1%) and feeling incompetent in 45 respondents (22.6%). Only 7 respondents (3.5%) reported that they would ask others for help (**Table 6**).

Table 6. Reasons for not providing first aid for sudden cardiac arrest (SCA) among respondents who would not intervene directly (n=199)

Reasons for not providing first aid	Frequency	Percentage	95% confidence level		p-value
			Lower	Upper	
Feel incompetent	45	22.6	17.2%	28.8%	<0.001
Fear being blamed	91	45.7	38.9%	52.7%	
Asking for help	7	3.5	1.6%	6.8%	
Minimum treatment provided	56	28.1	22.2%	34.7%	

First aid actions if provided

Among 30 (6.0%) respondents who would provide first aid, the type of first-aid action differed significantly across categories (p<0.001) (**Table 7**). Attempting to wake the victim was the most common action (50.0%), followed by applying aromatherapy ointment (36.7%). Only 13.3% reported that they would attempt CPR (**Table 7**).

Table 7. Types of first aid provided during sudden cardiac arrest (SCA) incidents among respondents who would provide first aid (n=30)

First aid provided	Frequency	Percentage	95% confidence level		p-value
			Lower	Upper	
Resuscitation	4	13.3	4.7%	28.7%	
Aromatherapy ointment	11	36.7	21.3%	54.5%	<0.001
Waking up victim	15	50.0	32.8%	67.2%	

Discussion

This study provides community-based evidence on the recognition of SCA, perceived cardiac risk, intended bystander responses, barriers to first aid, and the types of actions likely to be taken during SCA incidents in Sidoarjo District, Indonesia. Overall, the findings indicate limited public alertness and responsiveness to SCA. Respondents were much more familiar with heart attack and coronary disease than with SCA, and only a small proportion would provide first aid directly. These findings suggest that SCA remains poorly understood as a distinct, time-critical emergency in this community.

The low recognition of SCA is concerning because early identification is essential for timely CPR and survival. Although SCA can lead to death within minutes without immediate intervention, only 2.6% of respondents recognized SCA as a heart disease type, while a heart attack was far more commonly recognized. This pattern suggests that public knowledge of cardiac emergencies may still be centered on heart attack rather than cardiac arrest. This distinction is important because heart attack and SCA require different emergency responses: heart attack is commonly associated with chest pain and preserved consciousness, whereas SCA is characterized by sudden collapse, unresponsiveness, and abnormal or absent breathing. Similar gaps in public understanding have been reported elsewhere, where SCA is often confused with heart attack or other cardiovascular conditions [15-18]. In Indonesia, public health communication on cardiovascular disease has largely emphasized prevention, risk factors, and access to services, with less visible emphasis on emergency recognition and bystander action [14].

The perception of life-threatening heart disease also showed a mismatch between perceived danger and the urgency of SCA. Heart attack was most frequently perceived as the most life-threatening condition, while fewer respondents identified SCA as the most dangerous. This finding is consistent with the low recognition of SCA and indicates that respondents may not fully understand the immediate fatal risk of cardiac arrest. Since most SCA events occur outside hospitals, delayed recognition by family members, community members, or other bystanders may reduce the likelihood of timely CPR and survival [1,6,7]. Therefore, public education should clearly distinguish SCA from other cardiac conditions and emphasize simple recognition cues, such as sudden collapse, unresponsiveness, and abnormal breathing.

The intended response to SCA further demonstrates limited readiness for direct bystander intervention. More than half of respondents reported that they would seek medical aid, while only 6.0% would provide first aid. Seeking medical help is appropriate, but reliance on external help alone may be insufficient when immediate chest compressions are needed before emergency personnel arrive. Previous studies have shown that early bystander CPR and defibrillation can substantially improve survival after out-of-hospital cardiac arrest [8,9]. However, bystander intervention remains variable across settings and is often lower where CPR training, emergency dispatch support, and public access defibrillation are limited [10]. In the Indonesian context, delays in emergency response may further increase the importance of layperson action during the first few minutes after collapse [19,20].

Among respondents who would seek medical aid, calling an emergency unit was the most common response. This indicates that many respondents recognized the need to contact formal emergency services. However, only a small proportion reported that they would provide minimum first aid while seeking help. This finding suggests that many respondents viewed emergency response as the responsibility of health workers or emergency units rather than as an action that can be initiated by bystanders. In settings where emergency medical services may not arrive within the optimal resuscitation window, this passive waiting period can be critical. International evidence indicates that survival decreases rapidly when CPR and defibrillation are delayed [21]. Public education should therefore emphasize a dual response: calling emergency services while starting hands-only CPR immediately when SCA is suspected.

The most common barrier to providing first aid was fear of being blamed, followed by lack of knowledge about first aid and feeling incompetent. These findings suggest that barriers to bystander action are not only technical but also psychological and social. Fear of blame may reflect concern about making mistakes, causing harm, or being held responsible if the victim dies. Similar barriers have been identified in studies of lay responders, including fear, uncertainty, lack of confidence, and concern about legal or social consequences [22-25]. In Indonesia, where legal

protection for lay rescuers is not widely understood, fear of blame may be particularly important. Reports of violence or conflict involving health workers may also contribute to public concern about negative consequences after emergency care, although this study did not directly measure such experiences [26-29]. Therefore, CPR education should be accompanied by clear public messaging that encourages safe assistance and reduces fear of social or legal repercussions.

The types of first aid that respondents would provide also indicate important misconceptions. Among the small group willing to provide first aid, most would attempt to wake the victim or apply aromatherapy ointment, while only a small proportion would attempt CPR or resuscitation. These actions may reflect common community responses to fainting or temporary loss of consciousness, but they are not sufficient for SCA. In Indonesia, practices such as applying cajuput oil or menthol-based aromatherapy are commonly used for fainting or discomfort; however, they may delay chest compressions when the victim is actually in cardiac arrest. Public health messages should address this issue carefully by acknowledging that such practices may be familiar in everyday situations but are not appropriate when a person is unresponsive and not breathing normally. A simple message such as "check response, check breathing, call for help, and start chest compressions" may be more practical for community-level education.

The findings support the need for multi-level intervention. At the community level, public campaigns should focus on recognizing SCA and promoting hands-only CPR as a simple and immediate action. At the education and workplace levels, structured CPR training could be introduced through schools, community organizations, workplaces, and health cadres. Evidence from other settings suggests that basic life support training can improve willingness, confidence, and bystander CPR rates [30-37]. At the health-system level, emergency dispatch systems should support telephone-assisted CPR and provide clear instructions to callers while help is on the way. At the policy level, clearer protection for lay rescuers may help reduce fear of blame and increase willingness to act.

This study has some limitations that need to be acknowledged. It measured intended responses rather than actual behavior during real SCA events. The study was conducted in one district, and findings may not represent other Indonesian settings with different social, cultural, or emergency service contexts. The questionnaire used single-response items, which may not fully capture the complexity of bystander decision-making. Future studies should include broader populations, assess CPR knowledge and practical skills in more detail, and evaluate the effectiveness of community-based CPR education and emergency response interventions.

Conclusion

This study showed low community alertness and responsiveness to SCA in Sidoarjo District, Indonesia. SCA was poorly recognized as a distinct, time-critical emergency, and most respondents preferred to seek medical help or remain passive rather than provide immediate first aid. Fear of being blamed, lack of knowledge, and perceived incompetence were the main barriers to bystander action. Among those willing to help, most reported actions such as waking the victim or applying aromatherapy ointment, whereas CPR was rarely mentioned. These findings highlight the need for community-based SCA education, hands-only CPR training, clearer emergency response guidance, and culturally sensitive public messaging. Training may improve knowledge and confidence, but fear of blame suggests that broader social and policy-level approaches are also needed, including clearer guidance and protection for lay rescuers. A combined strategy involving schools, workplaces, community groups, and health services could help reduce delays in first aid and improve community readiness to respond to SCA.

Ethics approval

Ethical clearance was granted by the Ethics Committee of Politeknik Kesehatan Kemenkes Surabaya, Indonesia (No. EA/1604/KEPK-Poltekkes_Sby/V/2023, 11 April 2023) and the Sidoarjo District Protection Board (No. 070/900/438.6.5/2023, 3 April 2023). All procedures followed the Declaration of Helsinki.

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Competing interests

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Underlying data

The datasets generated and analyzed during this study are available from the corresponding author upon reasonable request.

Declaration of artificial intelligence use

An AI-based language model, DeepSeek, was used to assist with technical writing (providing suggestions for structuring complex technical descriptions more effectively). Authors confirm that all AI-assisted processes were critically reviewed by the authors to ensure the integrity and reliability of the results. The final decisions and interpretations presented in this article were solely made by the authors.

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