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Knowledge of Basic Life Support Among the General Population in Arar City, Saudi Arabia: A Cross-Sectional Study

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Abstract **Background:** Cardiac arrest is a leading cause of mortality and morbidity worldwide. Immediate administration of Basic Life Support (BLS) techniques by laypersons can significantly increase survival rates and minimize neurological damage. However, public knowledge and preparedness toward BLS remain low in many communities. This study aims to assess the level of awareness and knowledge of BLS among the non-medical population in Arar City, Saudi Arabia and to examine its association with educational level, age, gender and income. **Methods:** A cross-sectional study was conducted using an online self-administered validated questionnaire. The study included 400 non-medical individuals aged 18-60 years in Arar City from February to April 2024. Chi-square tests were used to analyze associations between demographic factors and BLS knowledge. **Results:** Only 62.7% of participants recognized signs of cardiac arrest. Significant knowledge deficits were identified in AED function (65.7% unaware), initial steps in fainting (67% incorrect) and proper CPR compression rate (69.7% unaware). Gender ($p = 0.0001$) and family monthly income ($p = 0.022$) were significantly associated with the likelihood of performing hands-only CPR, while region and age showed no significant relationship. **Conclusion:** Despite the critical importance of BLS in improving survival rates following cardiac arrest, a considerable percentage of participants demonstrated insufficient understanding of essential concepts. Gender and income-related disparities in CPR willingness highlight the need for targeted educational initiatives to improve BLS knowledge and skills in Arar City.

Key Words Awareness, basic life support, cardiopulmonary resuscitation, sudden cardiac arrest, cpr knowledge gaps, public health training, Arar, Saudi Arabia

INTRODUCTION

Cardiac arrest, the sudden cessation of effective heart function leading to unresponsiveness, absent breathing and circulatory failure [1-3], is a major cause of mortality and morbidity worldwide [1,2]. The global annual incidence rates range from 50-110 per 100,000 people, underscoring its critical public health importance. While most cardiac arrests occur outside of hospital settings, such as at home or in public areas, timely intervention is crucial for improving survival and minimizing neurological damage [4,5]. Every minute without CPR decreases survival chances by 7-10%, highlighting the urgency of addressing low BLS awareness in communities [6].

Bystander-initiated Basic Life Support (BLS), delivered promptly following cardiac arrest, demonstrably increases the probability of survival and reduces the severity of potential neurological sequelae [5]. BLS encompasses a range of life-saving procedures, including early recognition of cardiac arrest, emergency response activation, cardiopulmonary resuscitation (CPR), automated external defibrillator (AED) use, bleeding control and basic airway management [7]. Effective CPR, a cornerstone of BLS, significantly improves the chance of return of spontaneous circulation (ROSC) and survival [8].

However, significant knowledge gaps exist, both within the general public and even among healthcare

professionals [8]. Studies in diverse settings-including Karachi, Ethiopia and Saudi Arabia-reveal insufficient awareness and preparedness for BLS [5, 8-10]. For example, research in Saudi Arabia has highlighted a lack of knowledge regarding crucial initial actions in emergencies, even among individuals with a family history of heart conditions [5,10]. These findings underscore the persistent need to improve public awareness and preparedness for BLS despite global and national initiatives to enhance training [11].

Recent research has highlighted innovative approaches to BLS education. A 2022 study demonstrated the effectiveness of a Tele-Instructor Peer Feedback (TPF) approach, combining peer feedback with expert tele-instruction, which proved particularly valuable during the COVID-19 pandemic [12]. A 2023 review emphasized the potential of educating schoolchildren in BLS, recommending the CHECK-CALL-COMPRESS algorithm for all age groups and highlighting the role of teachers as effective BLS instructors [13]. Furthermore, a 2024 study explored the development of a hybrid BLS learning management system, integrating curriculum design, validation and website development to enhance BLS certification processes [14].

Despite these advancements, significant gaps remain in BLS training methodologies and public health interventions. There is a lack of standardization in BLS course content, format and quality among cities, leading to public confusion [15]. Current literature lacks focus on culturally specific barriers to BLS education and implementation, particularly in conservative societies like Saudi Arabia [16]. Additionally, while studies have shown that teachers can effectively learn and teach BLS, there is limited research on engaging other community leaders or influencers in BLS education [17].

In Saudi Arabia, where cardiovascular diseases are the leading cause of death, accounting for 37% of total mortality, improving BLS knowledge is particularly crucial [18]. Cultural and societal norms significantly influence CPR knowledge and willingness to perform it. Gender segregation norms, religious beliefs about physical contact with strangers, fatalistic attitudes toward death and misconceptions about CPR effectiveness can all impact bystander CPR rates and hinder BLS education and implementation [19].

This study distinguishes itself from prior research in Saudi Arabia by focusing specifically on the non-medical population in Arar City, a previously understudied region. Unlike earlier studies that primarily assessed healthcare providers or urban centers, our research provides insights into BLS awareness in a more diverse, general population setting. By examining cultural nuances alongside demographic factors, we aim to provide a more comprehensive understanding of BLS awareness in Saudi Arabia.

This study addresses the critical gap in BLS knowledge by evaluating awareness and preparedness among the non-medical population of Arar City, Saudi Arabia and examining its association with demographic factors. The results will inform the development of culturally sensitive, targeted interventions to enhance BLS competency within the community, potentially leading to improved outcomes in cardiac arrest situations and addressing the existing gaps in training methodologies and public health interventions.

Objectives

- We propose the following research questions:
  - What is the current level of BLS knowledge among the non-medical population in Arar City, Saudi Arabia?
  - How do demographic factors (age, gender, education level and income) correlate with BLS knowledge and willingness to perform CPR?
  - What are the specific knowledge gaps in BLS concepts and skills among the study population?
- We hypothesize that:
  - BLS knowledge will be suboptimal among the general population in Arar City.
  - Higher education levels and income will positively correlate with better BLS knowledge.
  - Gender and cultural factors will influence willingness to perform CPR.
  - The findings from this study will inform the development of targeted, culturally sensitive BLS training programs and public health initiatives in Arar City and similar regions in Saudi Arabia.

MATERIALS AND METHODS

Study Design and Participants

A cross-sectional study using an online questionnaire (Google Forms) was conducted from February to April 2024 in Arar, Saudi Arabia. Adults aged 18-60 years were recruited using non-probability cluster-convenient sampling. The authors acknowledge that the convenience sampling method introduces some potential biases. To mitigate this, the authors (a) Used multiple recruitment channels, including social media and community centers, to reach a diverse cross-section of Arar City's population, (b) Collected demographic data to assess how well our sample represents the general population, (c) Clearly stated sampling limitations in the manuscript for transparent interpretation of the current results and (d) Compared our findings with other Saudi Arabian studies to contextualize the results [20].

The inclusion criteria were non-medical residents of Arar City who were willing to participate in the study. Exclusion criteria included age <18 or >60 years, incomplete questionnaires (<50% completion), residence outside Arar and medical field workers or health science degree holders. The authors focused on non-medical participants in Arar City because (a) Previous studies in Saudi Arabia primarily assessed healthcare providers or urban centers [20], (b) Our study provides novel insights into BLS awareness in a more diverse, general population setting, (c) Arar City is an

understudied region, allowing us to address a critical knowledge gap, (d) assessing BLS knowledge among non-medical individuals is crucial, as they are often first responders in out-of-hospital cardiac arrests [20,21] and (e) Understanding BLS awareness in this population can inform targeted public health interventions to improve cardiac arrest outcomes in Arar City.

Sampling and Data Collection

A pre-validated, structured questionnaire based on a previous study of Almutairi *et al.* [5] was distributed in both English and Arabic (the mother language of the current population). To ensure its validity, the questionnaire was initially translated from English to Arabic by two bilingual experts in emergency medicine. An independent translator then performed a back-translation to ensure accuracy. A cognitive interview with ten local residents was conducted to ensure cultural appropriateness and comprehension of questions. A pilot study (for twenty individuals) was conducted to ensure questionnaire clarity and feasibility with internal consistency (Cronbach's alpha = 0.85) and test-retest reliability (intraclass correlation coefficient = 0.78).

The questionnaire encompasses three categories: (1) The sociodemographic-related data that includes residency, age, sex, marital status, educational level and monthly income, (2) Questions related to assessment of awareness/knowledge regarding BLS (Q6-Q16), (3) Questions related to attitude assessment (q17-q22). To mitigate the impact of dependence on self-reported data, which can introduce some potential biases, including social desirability bias and recall bias, the authors emphasized the anonymity of responses to encourage honest answers, included attention check questions to ensure participants were reading carefully and where possible, the authors cross-validated responses with objective knowledge questions.

Sample Size

Sample size was calculated using the formula:

$$n = \frac{DEFFNp(1-p)}{(d2/Z21- /2(N-1) + p*(1-p)}$$

Where,

p : 0.5 (50% expected proportion)
d : 0.05 (absolute error)
Z : 1.96
DEFF : 1 (design effect)

The calculated sample size was 384, which increased to 400 to account for a non-response rate.

Ethical Considerations

The study was approved by the "Local Bioethical Committee (HAP-09-A-043) of Northern Border University with decision no. (22/24/H) dated 08/02/2024." All participants provided informed consent before completing the online questionnaire. The consent form, presented at the beginning of the survey, outlined the study's purpose, the voluntary nature of participation and participants' right to withdraw at any time. No personally identifiable information was collected, ensuring participant anonymity. Data were stored securely on password-protected devices accessible only to the research team. To address ethical considerations specific to online surveys, we implemented measures to prevent multiple submissions from the same participant and provided contact information for the research team in case participants had questions or concerns.

Statistical Analysis

Data were collected into an Excel sheet, cleaned, coded and then analyzed using SPSS version 22 (IBM Corp., Armonk, New York, United States). Descriptive statistics were used to summarize participant characteristics and BLS knowledge scores. Nominal data were represented as frequencies and percentages. Chi-squared tests were used to analyze associations between categorical variables, including demographic factors (gender, income, education) and BLS knowledge levels. Fisher's exact test was employed when expected cell counts were less than 5. To address potential confounding, we stratified our analyses by key demographic variables (gender, income and education) to explore how these factors might influence the relationship between other variables and BLS knowledge. While we acknowledge the limitations of our analysis, we believe these methods provide valuable insights into BLS knowledge in our population. We recognize the potential for more advanced statistical techniques and will consider these for future studies. Statistical significance was set at $p<0.05$.

RESULTS

Table 1 presents the sociodemographic characteristics of the study participants (n = 400). The majority of respondents (93.3%) were from the Arar region. The sample was predominantly female (70.3%) and young, with 66.0% aged 18-30 years.

Regarding marital status, 56.3% were single, while 38.0% were married. Educational attainment varied, with 51.0% holding non-medical bachelor's degrees and 26.3% having medical bachelor's degrees.

Family monthly income was diverse, with 33.0% reporting less than 5,000 Saudi Riyals (SAR) and 18.3% earning more than 15,000 SAR.

Figure 1 illustrates participants' knowledge of proper chest compression depth during hands-only CPR for adults. Only 28.5% of respondents correctly identified the recommended depth of at least 2 inches (5 cm) but not more than 2.4 inches (6 cm). The majority of participants (71.5%) either underestimated, overestimated, or were unsure of the correct compression depth. Specifically, 22.8% believed the correct depth to be less than 2 inches, while 15.5% thought it should

Table 1: Sociodemographic characteristics of participants (n = 400)

Parameters	No	Percentage
Region		
Arar	373	93.3
Outside arar	27	6.8
Sex		
Female	281	70.3
Male	119	29.8
Age		
18 to 30 years	264	66.0
31 to 40 years	69	17.3
41 to 50 years	49	12.3
51 to 60 years	14	3.5
61 to 70 years	4	1.0
Marital status		
Single	225	56.3
Married	152	38.0
Divorced	18	4.5
Widowed	5	1.3
Education level		
Primary school	8	2.0
Middle school	8	2.0
High school	56	14.0
Bachelor medical degree	105	26.3
Bachelor non-medical degree	204	51.0
Postgraduate medical degree	8	2.0
Postgraduate non-medical degree	11	2.8
Family Monthly Income (SAR)		
Less than 5000	132	33.0
Between 5000 and 9999	127	31.8
Between 10000 and 14999	68	17.0
More than 15000	73	18.3

Data are presented as numbers (No) and percentages (%)

be more than 2.4 inches. Notably, a substantial proportion (33.3%) of respondents admitted to not knowing the proper compression depth. These findings highlight a significant knowledge gap among the general population regarding a critical aspect of effective CPR technique.

Table 2 presents insights into the general public's knowledge of basic life support procedures, revealing significant gaps in understanding that could impact emergency response effectiveness. While 62.7% of respondents correctly identified that a person becomes unresponsive and stops breathing normally when the heart stops, a concerning 15.3% reported not knowing what happens in this scenario. This highlights a critical need for education on recognizing cardiac arrest symptoms.

Knowledge of AED functionality was limited, with only 27% correctly understanding that an AED reads the heartbeat and determines if a shock is needed. Notably, 34.3% of respondents reported not knowing what an AED does, indicating a pressing need for widespread training on this life-saving device.

Responses regarding the initial steps for a fainted person were divided, with 33% correctly identifying checking for breathing as the first step. However, 19.5% incorrectly stated that calling 911 and getting an AED should be the initial action, underscoring the importance of standardized first aid training.

Knowledge of hands-only CPR techniques was also lacking. Only 31.5% of respondents were aware that chest compressions should be at least 2 inches deep and just 30.3% knew the recommended compression rate of 100-120 per minute. This suggests a critical need for targeted education and hands-on training in proper CPR techniques.

Figure 2 illustrates participants' knowledge of the appropriate first action when encountering an unresponsive choking adult. The correct response, calling 911 and obtaining an external defibrillator, was identified by 34.5% of respondents. However, the majority of participants (65.5%) chose incorrect actions: 32.5% believed performing chest compressions should be the first step, 24.3% thought placing the person on the ground was the initial priority and 8.8% selected other unspecified actions.

These findings reveal a significant knowledge gap regarding the proper sequence of actions in this critical emergency scenario. Only about one-third of respondents recognized the importance of immediately activating emergency services and securing necessary medical equipment.

The analysis of Table 3 reveals significant gaps in public awareness and understanding of basic life support measures. A considerable portion of respondents, ranging from 12-37.3%, demonstrated insufficient knowledge to respond effectively in critical emergencies.

Notably, over 15% of participants were unaware of the implications when the heart stops beating, with only 62.7% correctly recognizing that the person becomes unresponsive and stops breathing normally. This lack of awareness could lead to delayed recognition of cardiac arrest, potentially impacting survival rates.

The data also highlighted a substantial knowledge gap regarding Automated External Defibrillators (AEDs), with 34.3% of respondents uncertain about their function. Furthermore, the study revealed uncertainties about appropriate initial actions when encountering a person who has fainted. Only 33% of respondents correctly identified "Check breathing" as the priority.

Table 4 Shows that participants willing to get more training on BLS have statistically insignificant relation to region, age, sex, educational level and family monthly income.

Table 5 Shows that participants' tendency to perform hands-only CPR has a significant relation to sex ($p = 0.0001$) and family monthly income ($p = 0.022$). It also shows a statistically insignificant relation to region and age.

DISCUSSION

Cardiac arrest remains a leading cause of mortality globally, necessitating immediate action for survival. With approximately 3.8 million out-of-hospital cardiac arrests occurring annually and a 60-80% pre-hospital mortality rate [22,23], the importance of effective BLS cannot be overstated [7]. The American Heart Association (AHA) defines BLS as the assistance provided by first responders during instances of cardiac or respiratory arrest to help save a life. Despite its critical role in preserving life, awareness and knowledge of BLS remain insufficient among the general population worldwide, including in Saudi Arabia [24].

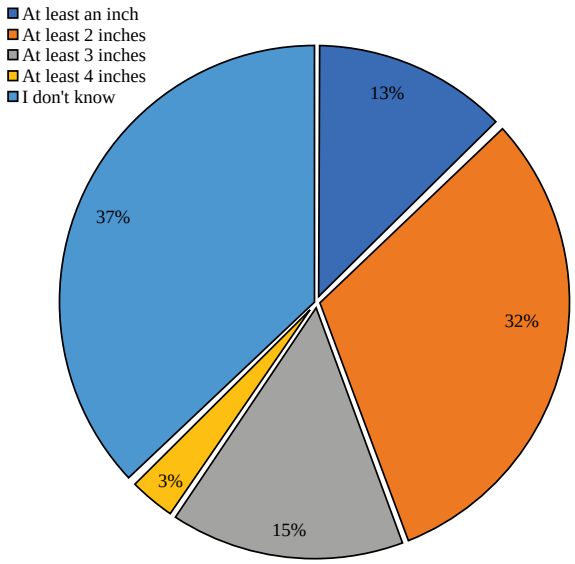

Figure 1: Knowledge about the depth of an adult's chest be compressed during CPR

Table 2: Parameters related to attitude regarding basic life support (n = 400)

Parameters		No.	Percentage
When the heart stops, what happens to a person?	The heart is still beating and pumping blood but the person is not breathing normally	21	5.3
	The heart is still beating and pumping blood and the person is still alive	34	8.5
	The heart is still beating, the person is not breathing normally and the blood stops moving	33	8.3
	The heart stops beating and the person becomes unresponsive and does not breathe normally	251	62.7
	I don't know	61	15.3
What does an automated external defibrillator do?	He calls 911 automatically and asks for help	48	12.0
	It calls 911 automatically and tells you if a stun is needed	23	5.8
	It tells you if a shock is needed and gives your heart rate	84	21.0
	It reads your heartbeat and tells you if a shock is needed	108	27.0
	I don't know	137	34.3
What is the correct first step when you arrive at a place where a person has fainted?	Call 911 and get an automated external defibrillator	78	19.5
	Chest compressions and call for help	80	20.0
	Make sure the place is safe	62	15.5
	Check breathing	132	33.0
	I don't know	48	12.0
When performing hands-only CPR, how many chest compressions should be performed each minute?	50 chest compressions	115	28.7
	100-120 chest compressions	121	30.3
	140-150 chest compressions	27	6.8
	150-200 chest compressions	9	2.3
	I don't know	128	32.0
How hard should you compress an adult's chest when performing hands-only CPR? (1 inch = 2.54 cm)	At least an inch	51	12.8
	At least 2 inches	126	31.5
	At least 3 inches	61	15.3
	At least 4 inches	13	3.3
	I don't know	149	37.3
Once you call for help, what are the next steps to administer hands-only CPR?	Begin chest compressions, check for breathing, call 911 and obtain an automated external defibrillator if available.	98	24.5
	Call 911, get an automated external defibrillator, begin chest compressions and check for breathing.	43	10.8
	Obtain an external defibrillator if available, check breathing, initiate chest compressions and call 911.	71	17.8
	Check breathing, initiate chest compressions, call 911 and obtain an automated external defibrillator.	84	21.0
	I don't know	104	26.0
Would you feel comfortable performing hands-only CPR if someone is going into cardiac arrest?	No	171	42.8
	Yes	229	57.3
When you perform breath-holding CPR on an adult, how many breaths do you give after every 30 compressions?	2 breaths	154	38.5
	4 breaths	76	19.0
	6 breaths	47	11.8
	8 breaths	16	4.0
	I don't know	107	26.8
What is the right first step to help a choking adult who has stopped responding?	Call 911 and obtain an external defibrillator	60	15.0
	ask for help	118	29.5
	Give 30 chest compressions	73	18.3
	Place the person on the ground	72	18.0
	I don't know	77	19.3

Data are presented as numbers (No) and percentages

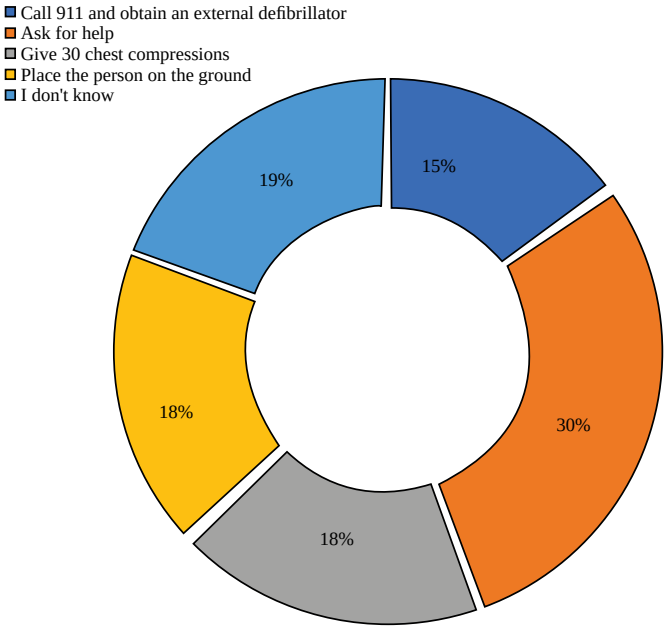

Figure 2: Knowledge about the first step done for a choking adult who has stopped responding

Table 3: Participants' knowledge about basic life support (n = 400)

Parameters		No.	Percentage
What are the signs of a child choking?	The child can cough and laugh	28	7.0
	The child cannot speak but he can cough	89	22.3
	The child cannot cough, speak, or breathe	193	48.3
	The child can talk and play	26	6.5
	I don't know	64	16.0
Of the following, which source constitutes the greatest factor in your knowledge about CPR? *	Movies or TV shows	95	23.7
	Relatives or friends	49	12.2
	Internet	154	38.5
	School	52	13.0
	Social media	174	43.5
	University	158	39.5
	Attending a first aid course	5	1.2
What do you think has had the greatest impact on your lack of knowledge about CPR?	The cost	33	8.3
	Shortage of time	125	31.4
	Lack of interest	86	21.6
	Unavailability	92	23.1
	Lack of use of information	1	0.3
	Lack of application in real life	1	0.3
	Nothing	1	0.3
	Unknown training site	58	14.5
	Not saving	1	0.3
In your opinion, what is the reason that has the greatest impact on not performing CPR in public places?	Lack of appropriate knowledge and skills	147	36.8
	Causing potential harm to the person in need	104	26.0
	Fear of infectious diseases that are transmitted mouth to mouth	76	19.0
	Fear of legal consequences	37	9.3
	Emotional factors	36	9.0
Are you interested in more CPR training in the future?	No	57	14.2
	Yes	343	85.8
Why do you want more CPR training?	Heart disease within the family	58	14.5
	Saving the lives of others-	274	68.5
	Other reasons	68	17.0
Are you ready to take a free CPR course?	No	49	12.3
	Yes	351	87.8
Do you think CPR training should be mandatory?	No, CPR training should be optional	53	13.3
	Yes, at school	172	43.0
	Yes, to obtain a driving license	39	9.8
	Yes, training should be mandatory in every job	136	34.0

Data are presented as numbers (No) and percentages. *Results may overlap.

Our study aimed to evaluate BLS knowledge among the general population in Arar City, considering factors such as educational level, age and gender. The findings revealed significant knowledge gaps: Only 62.7% of participants recognized that cardiac arrest leads to unresponsiveness and cessation of normal breathing, while 34.3% were uncertain

Table 4: The relation between participants interested in more training on BLS

	Interested in more training on BLS			
Parameters	No	Yes	Total (n = 400)	p-value*
Region				
Outside Arar	5	22	27	0.511
	8.8%	6.4%	6.8%	
Arar	52	321	373	
	91.2%	93.6%	93.3%	
Age				
18 to 30 years	38	226	264	0.257
	66.7%	65.9%	66.0%	
31 to 40 years	7	62	69	
	12.3%	18.1%	17.3%	
41 to 50 years	8	41	49	
	14.0%	12.0%	12.3%	
51 to 60 years	2	12	14	
	3.5%	3.5%	3.5%	
61 to 70 years	2	2	4	
	3.5%	0.6%	1.0%	
Sex				
Female	36	245	281	0.206
	63.2%	71.4%	70.3%	
Male	21	98	119	
	36.8%	28.6%	29.8%	
Marital status				
Single	31	194	225	N/A
	54.4%	56.6%	56.3%	
Married	21	131	152	
	36.8%	38.2%	38.0%	
Divorced	5	13	18	
	8.8%	3.8%	4.5%	
Widowed	0	5	5	
	0.0%	1.5%	1.3%	
Education level				
Primary school	1	7	8	0.193
	1.8%	2.0%	2.0%	
Middle school	2	6	8	
	3.5%	1.7%	2.0%	
High school	8	48	56	
	14.0%	14.0%	14.0%	
Bachelor medical degree	7	98	105	
	12.3%	28.6%	26.3%	
Bachelor non-medical degree	35	169	204	
	61.4%	49.3%	51.0%	
Postgraduate medical degree	1	7	8	
	1.8%	2.0%	2.0%	
Postgraduate non-medical degree	3	8	11	
	5.3%	2.3%	2.8%	
Family monthly income				
Less than 5000	22	110	132	0.721
	38.6%	32.1%	33.0%	
5000 to 9999	18	109	127	
	31.6%	31.8%	31.8%	
10000 to 14999	9	59	68	
	15.8%	17.2%	17.0%	
More than 15000	8	65	73	
	14.0%	19.0%	18.3%	

*p-value was considered significant if ≤0.05

about AED functionality. Moreover, only 33% correctly identified "Check breathing" as the initial step for a fainted person and a mere 30.3% knew the recommended hands-only CPR compression rate.

These results align with other studies conducted in Saudi Arabia and internationally. For instance, a study in Saudi Arabia found that only 39.2% of participants passed a BLS knowledge test despite over 60% holding bachelor's degrees [20]. Two studies revealed significant deficiencies in CPR and BLS knowledge among healthcare professionals. One observational study of 121 dental personnel, house officers and nurses demonstrated inadequate knowledge in the majority of participants [25]. Similarly, a survey of 304 medical students in Oman found that 53.6% possessed insufficient knowledge and 64.5% lacked prior BLS training [26]. This discrepancy between education level and BLS knowledge suggests that formal education alone may not be sufficient to ensure an adequate understanding of life-saving techniques. This may be attributed to the absence of mandatory BLS training in educational institutions or workplaces, potentially leading to lower levels of practical knowledge despite academic achievements.

Similarly, a study reported that chest discomfort was the most frequently recognized symptom, reported by 19% (343 participants). Other significant symptoms included loss of consciousness, identified by 14% (264 participants) and

Table 5: Association between feeling comfortable to perform hands-only CPR and sociodemographic characteristics

	Feel comfortable performing hands-only CPR			
Parameters	No	Yes	Total (N = 400)	p-value*
Region				
Outside Arar	10	17	27	0.534
	5.8%	7.4%	6.8%	
Arar	161	212	373	
	94.2%	92.6%	93.3%	
Age				
18 to 30 years	121	143	264	0.468
	70.8%	62.4%	66.0%	
31 to 40 years	26	43	69	
	15.2%	18.8%	17.3%	
41 to 50 years	17	32	49	
	9.9%	14.0%	12.3%	
51 to 60 years	6	8	14	
	3.5%	3.5%	3.5%	
61 to 70 years	1	3	4	
	0.6%	1.3%	1.0%	
Sex				
Female	136	145	281	0.0001
	79.5%	63.3%	70.3%	
Male	35	84	119	
	20.5%	36.7%	29.8%	
Marital status				
Single	100	125	225	N/A
	58.5%	54.6%	56.3%	
Married	66	86	152	
		38.6%	37.6%	38.0%
Divorced	5	13	18	
	2.9%	5.7%	4.5%	
Widowed	0	5	5	
	0.0%	2.2%	1.3%	
Education level				
Primary school	2	6	8	N/A
	1.2%	2.6%	2.0%	
Middle school	6	2	8	
	3.5%	0.9%	2.0%	
High school	25	31	56	
	14.6%	13.5%	14.0%	
Bachelor medical degree	58	47	105	
	33.9%	20.5%	26.3%	
Bachelor non-medical degree	75	129	204	
	43.9%	56.3%	51.0%	
Postgraduate medical degree	0	8	8	
	0.0%	3.5%	2.0%	
Postgraduate non-medical degree	5	6	11	
	2.9%	2.6%	2.8%	
Family monthly income				
Less than 5000	45	87	132	0.022
	26.3%	38.0%	33.0%	
5000 to 9999	54	73	127	
	31.6%	31.9%	31.8%	
10000 to 14999	31	37	68	
	18.1%	16.2%	17.0%	
More than 15000	41	32	73	
	24.0%	14.0%	18.3%	

*p-value was considered significant if ≤ 0.05

cessation of circulation, noted by 17% (307 participants). Furthermore, cessation of breathing was acknowledged by 14% (251 participants) [6]. This parallel finding across different populations underscores the global nature of the challenge in disseminating BLS knowledge effectively. Chair *et al.* [27] found that only (0.4%) of their participants answered all the CPR-related questions correctly. These results align with those of Ghanem *et al.* [28] who reported low overall BLS awareness, with only 48.7% of participants demonstrating adequate knowledge. A study investigating the knowledge of BLS among the general population in India found that the majority of people are unaware of the significance of basic life support and CPR of the 1,200 surveyed participants. Across these studies, consistently low BLS knowledge highlights the pervasiveness of knowledge gaps, emphasizing the urgency of improved strategies and training methodologies.

Interestingly, our study revealed a statistically significant relationship between the tendency to perform hands-only CPR and both genders and family monthly income, while region and age showed no significant association. This partially aligns with another study, which found a significant correlation between BLS knowledge and educational background but no significant influence of age or socioeconomic status [29]. The gender disparity in CPR performance willingness is particularly noteworthy and

warrants further investigation into potential cultural or social factors that may influence this trend [30]. For example, cultural norms regarding physical contact between genders may affect the willingness to perform CPR. Furthermore, our finding that 34.3% were uncertain about AED operations may be attributed to the limited availability of AEDs in public spaces in Arar City or insufficient public education about their use.

The knowledge deficits observed in our study and others highlight a critical need for improved BLS education and training among the general public. These findings are particularly concerning given the potential impact of bystander CPR on survival rates in out-of-hospital cardiac arrests. Research has consistently shown that early initiation of CPR by bystanders can significantly improve survival rates and neurological outcomes for cardiac arrest victims [31]. Therefore, addressing these knowledge gaps is not merely an academic exercise but a vital public health imperative.

Limitations of our study include its focus on a single city in Saudi Arabia, which may limit generalizability to other regions or countries. For instance, the predominantly young, female sample from the Arar region might reflect specific cultural or demographic factors that influence BLS awareness and willingness to perform CPR in ways that might not be applicable to other populations. Urban-rural differences, variations in healthcare infrastructure and diverse cultural norms across the country may yield different results elsewhere. Additionally, the use of a self-administered questionnaire may introduce response bias, as participants may overestimate their knowledge or provide socially desirable answers. Future studies could benefit from a more diverse geographic sample and include practical skills assessment alongside knowledge evaluation to provide a more comprehensive picture of BLS competency. Another limitation is the potential for selection bias in our sampling method. Those who chose to participate in the study may have had a pre-existing interest in or knowledge of BLS, potentially skewing the results. Future research could employ more randomized sampling techniques to mitigate this potential bias. Future studies should investigate the effectiveness of culturally tailored BLS training programs in improving knowledge and skills retention, as well as assess the impact of incorporating BLS training into school curricula or workplace safety programs in Saudi Arabia.

It is worth noting that the present findings have significant implications for national health policies in Saudi Arabia. The identified knowledge gaps underscore the need for a comprehensive national strategy to improve BLS awareness and skills. We recommend that policymakers consider mandating BLS training as part of school curricula and certain professional licensing requirements. Furthermore, national health insurance policies could incentivize BLS training by offering premium reductions for certified individuals. The gender disparities in CPR willingness highlight the need for gender-sensitive national public health campaigns. These policy recommendations, informed by our findings, could significantly enhance the nation's preparedness for cardiac emergencies and potentially reduce mortality rates from out-of-hospital cardiac arrests.

Clinical Implications

The results of this study underscore the urgent need for comprehensive, community-wide BLS training programs. Healthcare providers and policymakers should consider implementing targeted educational initiatives that address the specific knowledge gaps identified, such as recognizing cardiac arrest symptoms, understanding AED functionality and performing proper CPR techniques. These programs should be designed to reach all segments of the population, taking into account factors such as gender, income level and educational background. Targeted interventions are needed that address the specific knowledge gaps and cultural context of Arar City.

To address the identified knowledge gaps, we recommend integrating BLS education into existing community programs. This could include incorporating BLS training into workplace safety programs, community health initiatives and religious gatherings. Collaborations with local mosques, community centers and schools could provide platforms for regular BLS workshops. Additionally, leveraging social media and mobile applications for BLS awareness campaigns could effectively reach younger demographics. These community-based approaches should be tailored to address the specific cultural context and knowledge gaps identified in Arar City.

Moreover, efforts to increase public access to AEDs and promote their use could significantly improve outcomes in out-of-hospital cardiac arrests. This could include initiatives to place AEDs in high-traffic public areas and educate the public on their location and use. Raising awareness about AED availability and proper usage could significantly enhance emergency response capabilities in Arar City.

The gender disparity in willingness to perform hands-only CPR suggests a need for gender-specific interventions to encourage CPR participation across all demographics. This might involve addressing cultural barriers or providing targeted training programs that consider gender-specific concerns or learning styles. Addressing cultural barriers and tailoring training programs to consider gender-specific concerns could enhance CPR participation across all demographics.

The relationship between family monthly income and BLS knowledge highlights the importance of making BLS training accessible to all socioeconomic groups. Policymakers should consider subsidizing or providing free BLS training to ensure that financial constraints do not prevent individuals from acquiring these life-saving skills. Providing subsidized or free BLS training ensures that financial constraints do not hinder individuals from acquiring life-saving skills, thus promoting equitable access to BLS knowledge.

Furthermore, integrating BLS education into school curricula could help establish a foundation of knowledge from an early age. This approach has shown promise in other countries and could be adapted to the context of Saudi Arabia. Implementing this proactive approach could improve outcomes for the community.

CONCLUSION

In conclusion, while BLS knowledge is crucial for improving cardiac arrest outcomes, significant gaps persist among the general population in Arar City. These findings have broader public health implications, as inadequate BLS knowledge can lead to delayed or ineffective responses during cardiac emergencies, potentially increasing morbidity and mortality rates. Addressing these knowledge deficits through tailored educational programs and increased public awareness campaigns could substantially enhance community preparedness and potentially save lives in cardiac emergencies.

The findings of this study serve as a call to action for healthcare providers, policymakers and community leaders to prioritize BLS education and training as a vital public health initiative. Future research should focus on developing and evaluating culturally appropriate BLS training programs, particularly those targeting gender-specific barriers and socioeconomic disparities in BLS knowledge. Additionally, studies investigating the long-term retention of BLS skills and the impact of community-wide training programs on cardiac arrest outcomes are needed.

Next steps should include (a) Implementing pilot BLS training programs in schools and workplaces in Arar City, (b) Developing targeted interventions to address gender disparities in CPR willingness, (c) Conducting longitudinal studies to assess the impact of BLS education on community cardiac arrest outcomes and € exploring innovative teaching methods, such as simulation-based training and mobile applications, to enhance BLS knowledge retention.

By addressing these knowledge gaps and implementing evidence-based interventions, we can work towards creating a more resilient and prepared community, ultimately improving public health outcomes in Arar City and beyond.

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Conflicts of Interest

The authors declare that there are no conflicts of interest.

Ethical Statement

The study was approved by the "Local Bioethical Committee (HAP-09-A-043) of Northern Border University with decision no. (22/24/H) dated 08/02/2024." Written informed consent was obtained from all individual participants included in the study

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