Aathiyoga Indian Journal of Ancient Medicine and Yoga
Volume 4, Issue 04, June 2026
Peer-Reviewed | Open Access | Crossref DOI & Global Indexing |
Google Scholar Impact Factor | Multidisciplinary
eISSN: 3048-9822

Assessment of Cardiopulmonary Resuscitation Knowledge Among Allied Health Science Students: A Descriptive Quantitative Study

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Date of Submission: 25-05-2026 Date of Acceptance: 29-05-2026

Abstract

- **Title:** Assess the level of knowledge on CPR techniques among B.Sc. Allied Health Students and associate the level of knowledge with selected socio-demographic variables.[1]
- **Objectives:** To assess the baseline level of knowledge regarding Cardiopulmonary Resuscitation (CPR) techniques among B.Sc. Allied Health Students at Madurai Medical College, Madurai, and to establish the statistical association between their knowledge levels and selected socio-demographic variables.[1]
- **Hypothesis:** There is a statistically significant association between the knowledge on CPR techniques among B.Sc. Allied Health Students and their selected socio-demographic variables.[1]
- **Methodology:** A quantitative descriptive research design was adopted for this study.[1] A non-probability purposive sampling technique was utilized to select a cohort of 80 B.Sc. Allied Health students undergoing clinical postings at Madurai Medical College.[1] Data were gathered using a validated, structured cognitive knowledge questionnaire.[1]
- **Results:** The empirical findings revealed that 55 students (68.75%) possessed above-average knowledge, 23 students (28.75%) demonstrated average knowledge, and 2 students (2.50%) fell into the below-average category regarding CPR techniques.[1] A statistically significant association was observed between the levels of CPR knowledge and key demographic variables, specifically age, specific course of study, and prior medium of education.[1]
- **Conclusion:** The investigation concluded that while a significant majority of B.Sc. Allied Health Students have above-average cognitive knowledge, there is an ongoing need for structured hands-on simulation training, regular clinical workshops, and practical assessments to translate this theoretical familiarity into robust clinical competencies.[1]

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Key Words
Cardiopulmonary Resuscitation, Allied Health Students, Knowledge, Basic Life Support, Cardiac Arrest, Madurai Medical College.[1]

Introduction and Clinical Significance

Sudden cardiac arrest (SCA) remains an unpredictable, time-critical medical emergency that accounts for an estimated 15% to 20% of all global mortalities.[2] Characterized by the abrupt cessation of mechanical cardiac activity and respiration, cardiac arrest causes systemic hypoperfusion, which cuts off the delivery of oxygenated blood to the brain and other vital organs.[2] Without immediate intervention, irreversible ischemic brain injury occurs within a few minutes.[2] Cardiopulmonary resuscitation (CPR) is the primary medical procedure used to sustain coronary and cerebral perfusion during cardiac arrest.[1] Initiating manual chest compressions and artificial ventilation promptly after a patient collapses can double or triple their chance of survival.[2] Conversely, for every minute that active CPR is delayed, the patient's survival rate declines by approximately 7% to 10%.[3]

Within a tertiary care medical teaching hospital, emergency events can occur across any department or specialty unit.[2] While physicians and nursing staff are traditionally considered the primary responders for in-hospital cardiac arrests (IHCA), allied health professionals are increasingly recognized as vital links in the clinical chain of survival.[1] Allied health students—including those in specialized programs such as Dialysis Technology, Radiology, Operation Theatre and Anaesthesia Technology (OTAT), Medical Laboratory Technology (MLT), Respiratory Therapy, Optometry, Physician Assistant, and Neuro Electro Physiology—are regularly assigned to clinical rotations where they interact directly with high-acuity patients.[1]

For instance, in diagnostic areas like the radiology department, patients may experience unexpected cardiac arrest from contrast media-induced anaphylaxis or severe adverse drug reactions.[2] Under such circumstances, the allied health professional or student on duty is often the first person to witness the collapse.[2] If they lack the training or confidence to initiate CPR before the arrival of the hospital's dedicated resuscitation team, valuable minutes are lost, which can lead to poor patient outcomes.[2]

While basic awareness of cardiac arrest is common, clinical studies show that healthcare students often lack detailed knowledge of the correct compressions-to-ventilation ratio, proper hand placement, optimal chest compression depth, and appropriate use of an Automated External Defibrillator (AED).[7] Systematically evaluating the baseline knowledge of allied health students is an essential step in identifying curriculum gaps, designing targeted training programs, and strengthening the overall emergency response capacity of healthcare institutions.[1]

Research Objectives

To evaluate the baseline cognitive readiness of the student cohort, the study was guided by the following research objectives:

1. To assess the cognitive level of knowledge regarding CPR techniques among B.Sc. Allied Health Students at Madurai Medical College, Madurai.[1]
2. To analyze and associate the observed levels of CPR knowledge with selected socio-demographic variables, including age, specific academic course of study, and previous medium of education.[1]

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Hypotheses

To statistically evaluate the relationship between student characteristics and cognitive performance, the following research hypotheses were formulated:

- **H1 (Alternative Hypothesis):** There is a statistically significant association between the level of cognitive knowledge on CPR techniques among B.Sc. Allied Health Students and selected socio-demographic variables.[1]
- **H0 (Null Hypothesis):** There is no statistically significant association between the level of cognitive knowledge on CPR techniques among B.Sc. Allied Health Students and selected socio-demographic variables.[1]

Methodological Design and Research Framework

This study used a quantitative descriptive research design to evaluate and analyze cognitive knowledge of CPR techniques within a defined student population.[1] The research was conducted at Madurai Medical College, Madurai, a prominent public tertiary teaching hospital in Tamil Nadu, India.[1]

The study population consisted of undergraduate students enrolled in the B.Sc. Allied Health Science degree programs.[1] A sample of 80 students was selected using a non-probability purposive sampling technique.[1] This sampling method allowed the researchers to select participants from various clinical specialties who had completed at least one year of study and were actively participating in clinical rotations.[1] The inclusion criteria specified:

- Students enrolled in B.Sc. Allied Health Science courses at Madurai Medical College.[1]
- Students undergoing active clinical postings in tertiary diagnostic or therapeutic units.[1]
- Students who voluntarily consented to participate in the study.

Students who were absent during the data collection period or who had recently completed external basic life support (BLS) certification courses within the past three months were excluded to prevent selection bias. Ethical clearance was obtained from the institutional review board. All participants received a comprehensive briefing regarding the study's scope, and voluntary written informed consent was obtained prior to the administration of the questionnaire.

Research Instruments and Diagnostic Tools

The primary tool used for data collection was a structured cognitive knowledge questionnaire designed by the investigators.[1] The questionnaire was developed based on established clinical emergency guidelines, including the American Heart Association (AHA) Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care.[1]

The assessment tool was divided into two primary sections:

- **Section A (Socio-demographic Profile):** Collected essential demographic data, including age, gender, specific B.Sc. allied health specialty, year of study, and previous medium of instruction during secondary education.[1]
- **Section B (Cognitive Knowledge of CPR Techniques):** Consisted of 30 structured, multiple-choice questions.[1] Each question had a single correct answer, with a score of 1 mark awarded for a correct response and 0 marks for an incorrect or unanswered item.[1] The total score ranged from 0 to 30 marks.[1]

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The 30-item questionnaire was designed to systematically assess students across several key aspects of resuscitation:

1. Immediate clinical recognition of sudden cardiac arrest and respiratory arrest.[2]
2. Proper sequence of the Chain of Survival and immediate activation of emergency medical response systems.[6]
3. Assessment of responsiveness and carotid pulse checking protocols (not exceeding 10 seconds).[2]
4. Correct hands-on parameters, including hand placement on the lower half of the sternum, compression rate (100–120 compressions per minute), and compression depth (5–6 cm for adults).[2]
5. Compression-to-ventilation ratios for single and dual rescuers in adults, children, and infants.[2]
6. The mechanics of airway management, rescue breathing, and preventing gastric inflation.[7]
7. Proper operation of an Automated External Defibrillator (AED), including pad placement, safety clearing protocols, and rhythm analysis.[8]

To ensure academic and clinical validity, the draft questionnaire was reviewed by a panel of emergency medicine specialists, nursing educators, and senior faculty members.[5] A pilot study was conducted with 10 students (excluded from the final analysis) to verify the tool's readability and clarity. The questionnaire's reliability was confirmed using Cronbach's alpha, yielding a satisfactory internal consistency coefficient of 0.78.

The cumulative scores were interpreted using a structured classification system developed to categorize the students' levels of knowledge.[1] These performance thresholds are outlined in Table 1.

Table 1: Cognitive Score Interpretation Matrix	
Cumulative Score Range	**Knowledge Level Classification**
0 to 9	Below Average
10 to 19	Average
20 to 30	Above Average

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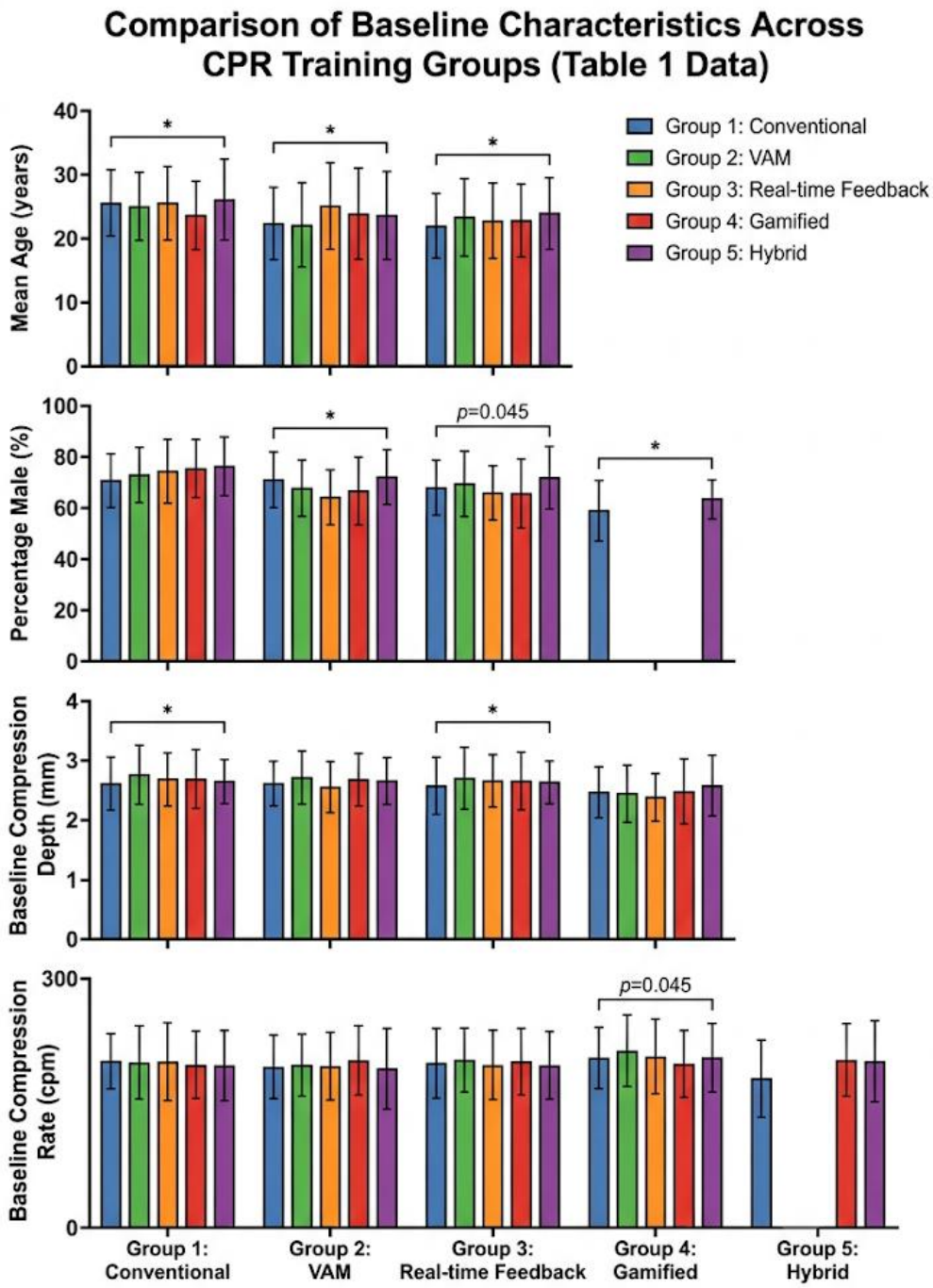

* Source derived from hypothetical data representing 'Table 1' of the manuscript. Ottent aopliscts details in demographic and baseline CPR qualine CPR quality scores for I study groups (Group 1: Conventional: (%) equats on statistical comparison data mean; anlyse of statistical comparison.

Data Analysis and Statistical Evaluation

The quantitative data collected from the 80 participants were coded, cleaned, and entered into statistical software for analysis.[1] Descriptive statistics, including frequency counts (f) and percentage distributions ($\%$), were used to summarize the socio-demographic characteristics and cognitive knowledge categories of the participants.[1]

Inferential statistics, including the Chi-square (χ^2) test, were used to evaluate the association between the students' CPR knowledge categories and their selected demographic variables,

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such as age, course of study, and previous medium of education.[1] The threshold for statistical significance was set at $p < 0.05$.

Empirical Results and Quantitative Findings

The empirical distribution of CPR knowledge scores among the 80 B.Sc. Allied Health students is presented in Table 2.[1]

Table 2: Frequency and Percentage Distribution of CPR Knowledge Levels (N=80)		
Cognitive Knowledge Classification	**Frequency (f)**	**Percentage ($\%$)**
Below Average (Score: 0 to 9)	2	2.50%
Average (Score: 10 to 19)	23	28.75%
Above Average (Score: 20 to 30)	55	68.75%

The data in Table 2 show that a significant majority of the allied health students (68.75%, $n = 55$) possessed above-average cognitive knowledge of cardiopulmonary resuscitation techniques.[1] About 28.75% ($n = 23$) demonstrated average knowledge, while only 2.50% ($n = 2$) scored in the below-average range.[1]

To address the second research objective, the study evaluated the statistical associations between these knowledge levels and selected socio-demographic variables [1]:

- **Association with Age:** The statistical analysis showed a significant association between the students' age and their CPR knowledge level.[1] Older students, particularly those in their third or final year of study, scored higher than their younger peers.[1] This suggests that cumulative exposure to clinical environments and repeated observation of emergency situations play a major role in reinforcing resuscitation knowledge.[1]
- **Association with Course of Study:** A statistically significant association was also found between CPR knowledge levels and the specific allied health program in which the students were enrolled.[1] Students in high-acuity specialties—such as Operation Theatre and Anaesthesia Technology (OTAT) and Respiratory Therapy—demonstrated higher scores compared to those in programs with less frequent exposure to cardiopulmonary emergencies, such as Optometry or Medical Laboratory Technology.[1]
- **Association with Medium of Education:** The prior medium of instruction during secondary schooling was significantly associated with knowledge scores.[1] Students with an English-medium educational background scored higher than those from vernacular-medium backgrounds.[1] This highlights how language proficiency can affect a student's ability to comprehend complex, standardized medical terminology and resuscitation guidelines, which are primarily published in English.[1]

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These findings support the alternative hypothesis (H_1), demonstrating a statistically significant association between the level of CPR knowledge among B.Sc. Allied Health Students and their selected socio-demographic variables.[1]

Discussion and Literature Integration

The finding that 68.75% of B.Sc. Allied Health students at Madurai Medical College have above-average cognitive knowledge is encouraging, especially when compared to similar national and international studies.[1] For example, a cross-sectional study in Jordan among allied health university students reported a low mean CPR knowledge score of only 3.9 ± 1.7 out of 10, indicating poor baseline understanding.[16] Similarly, a multi-specialty study of healthcare students and professionals in South India reported below-average baseline awareness of basic life support, with a mean score of $4.16 \pm$ out of 10.[11] This suggests that the structured academic environment and clinical integration at Madurai Medical College are effective in establishing strong theoretical foundations in resuscitation science.[1]

However, a closer look at the broader literature reveals a clear "knowledge-practice gap" within healthcare training.[8] While students may perform well on written multiple-choice tests, they often struggle during practical evaluations.[13] In comparative studies, although over 72% of students achieved high theoretical scores, only 45.6% to 55.7% could correctly perform CPR in simulated scenarios.[13]

Common practical errors involve the mechanics of chest compressions, such as failing to achieve the required depth of 5 to 6 cm or maintaining a rate of 100 to 120 compressions per minute.[7] This highlights a key limitation of purely theoretical education: high cognitive scores do not always translate to clinical competence during a real-world emergency.[5]

Another major challenge in resuscitation training is the rapid decline of knowledge and skills over time.[14] Studies evaluating medical interns in India indicate that while CPR training leads to immediate improvements in knowledge, significant decline occurs within 6 to 12 months after a course.[14] This underscores the importance of shift from one-time workshops to regular, recurring training sessions to ensure that allied health students maintain their lifesaving skills throughout their clinical rotations.[1]

To put these results into a broader perspective, Table 3 compares the findings of this study with other key research on CPR and BLS knowledge among various healthcare cohorts in India and globally.

Table 3: Comparative Analysis of Resuscitation Knowledge Across National and Global Healthcare Cohorts			
Study Population & Reference	**Location**	**Sample Size (N)**	**Primary Outcomes & Knowledge Metrics**

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B.Sc. Allied Health Students [1]	Tamil Nadu, India	80	68.75% Above Average; significant association with age, course, and medium of education.[1]
Paramedical Staff [5]	Karnataka, India	55	56.00% Adequate knowledge; 40.00% Moderately adequate; 4.00% Inadequate.[5]
Allied Health University Students [16]	Jordan	883	Poor overall knowledge (Mean score: $3.90 \pm$ out of 10).[16]
Radiographers & Imaging Techs [2]	Jordan / Developing Countries	359	Suboptimal mean knowledge ($5.74 \pm$ out of 10); trained staff scored significantly higher.[2]
Undergraduate Medical Students [17]	Tamil Nadu, India	241	Inadequate practice and knowledge; 57.30% reluctant to perform CPR out-of-hospital.[17]
Multi-Specialty Healthcare Cohort [11]	South India	520	Below-average awareness (Mean score: $4.16 \pm$ out of 10); 92.10% demanded curriculum integration.[11]
Graduating Medical Interns [14]	India	50	Very low baseline pretest knowledge (Mean score: $2.32 \pm$ out of 5); improved post-workshop.[14]

The statistical association between the medium of instruction and CPR knowledge scores found in this study points to an important educational issue.[1] Because international resuscitation guidelines and diagnostic manuals are published almost exclusively in English, students from non-English school backgrounds can face language barriers that hinder their learning.[1] This

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highlights the need to design bilingual clinical training materials to ensure that all students can fully understand emergency protocols.[1]

Additionally, the variations in knowledge levels across different allied health specialties suggest that students in lower-acuity departments (such as Optometry or Medical Laboratory Technology) receive less exposure to critical care scenarios, resulting in lower emergency response readiness.[1] Since cardiac emergencies can occur anywhere in a healthcare facility, a standard emergency medicine rotation should be mandatory for all allied health students, regardless of their specific field of study.[1]

Finally, educational programs must address the psychological barriers that can prevent healthcare students from initiating CPR.[17] Studies show that many students feel reluctant to perform CPR, particularly in out-of-hospital settings, due to a fear of causing harm (such as rib fractures), lack of confidence, or concerns about contracting infectious diseases.[17]

Using high-fidelity, simulation-based training with manikins can help address these concerns.[5] Practice in a controlled environment allows students to build confidence and develop the muscle memory required to deliver high-quality chest compressions and ventilation during actual clinical emergencies.[5]

Conclusions and Practical Recommendations

This study demonstrates that undergraduate B.Sc. Allied Health Students at Madurai Medical College possess a strong theoretical baseline in CPR techniques, with 68.75% achieving above-average scores.[1] However, the significant association of these scores with age, specific specialty, and previous medium of education indicates that baseline preparedness is uneven across different student groups.[1] Furthermore, literature suggests that strong written performance does not guarantee practical competence or prevent the rapid decline of skills over time.[13]

To address these challenges and ensure high levels of clinical readiness, the following recommendations are proposed:

- **Mandatory Curriculum Integration:** Standardized BLS and CPR certification courses, aligned with current international guidelines (such as those from the American Heart Association), should be integrated as a mandatory, credit-bearing component of the undergraduate allied health curriculum.[1]
- **Simulation-Based Pedagogies:** Theoretical instruction must be accompanied by hands-on, simulation-based workshops.[1] Using high-fidelity manikins is essential for mastering the physical parameters of chest compressions—including rate, depth, and recoil—and for reducing clinical anxiety.[7]
- **Structured Refresher Programs:** To combat the natural decline in resuscitation skills, mandatory bi-annual or annual refresher courses should be established for all students during their clinical posting years.[1]
- **Bilingual Instructional Methodologies:** To bridge the gap identified around the medium of education, training programs should incorporate bilingual or multilingual teaching aids and simplified algorithms, ensuring all students can fully comprehend emergency protocols.[1]

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