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A quasi-experimental study to assess the effectiveness of compression only life support (COLS) educational program on knowledge and skills of optometry and physiotherapist trainees in a tertiary care center of North India

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Abstract

Introduction: Early and effective performance of Compression-Only Life Support (COLS) is critical for improving survival in cardiac arrest. Despite guidelines, allied health trainees often lack adequate knowledge and skills in COLS, highlighting the need for structured educational interventions.

Aim: To assess the effectiveness of an educational program in improving knowledge and practical skills of COLS among allied health trainees.

Methods and Design: A quasi-experimental study was conducted from January 2024 to September 2024, involving 220 trainees from optometry (n=190) and physiotherapy (n=30) programs. An educational program based on standard COLS guidelines and algorithm was delivered, followed by hands-on training sessions. Knowledge was assessed pre- and post-intervention using a structured questionnaire, and practical skills were evaluated using a standardized COLS checklist. Participants received immediate feedback, and barriers to skill performance were documented. Skill reinforcement was provided until all participants achieved full competence.

Results: The mean age of participants was 27.18 ± 9.49 years, with 97 males (44.1%) and 123 females (55.9%). Baseline knowledge was inadequate (mean 4.15 ± 2.4) but improved significantly after training (mean 15.30 ± 2.85, p=0.001). In the first attempt, 85% of participants performed COLS correctly, with reinforcement and repeated practice leading to 100% competence by the third attempt across all checklist items, including scene safety, victim recognition, emergency activation, and chest compressions.

Conclusion: A structured educational program incorporating guidelines, algorithm-based instruction, and hands-on training effectively improved knowledge and skills in COLS among allied health trainees. Repeated practice and feedback ensured universal competence, demonstrating the value of structured interventions in life-saving training.

Keywords: Compression only life support, cardiac arrest, cardiopulmonary resuscitation, out of hospital cardiac arrest

Introduction

In India the estimated mortality due to sudden cardiac arrest is alarmingly high, with approximately 4,280 deaths per 1,00,000 population reported annually, of which nearly 85% occur outside the hospital settings [1]. Despite this burden, the response to out of hospital cardiac arrest (OHCA) remains inadequate. Evidence shows that although 56.5% of OHCA are witnessed only 1.3% of victims receive bystander cardiopulmonary resuscitation (CPR), reflecting a critical gap in community based response [2]. Timely initiation of high quality CPR combined with early defibrillation significantly improves survival and neurological outcomes [3].

This highlights the urgent need of expanding the CPR competency beyond healthcare professionals to allied health and paramedical students [1, 4, 5]. Several international professional bodies like American Heart Association, European Resuscitation Council have developed evidence

based guidelines for lay rescuer [5, 6]. In alignment with these global initiatives, the Indian Resuscitation Council (IRC) has introduced the Compression Only life support (COLS) protocol, a simplified guideline designed to empower untrained rescuers to take immediate life-saving action [1]. These guidelines have been disseminated widely across India with major outreach programs such as World Restart day which trained a large group of people in a single campaign [7, 8].

However despite the availability of COLS limited data exist on its knowledge retention, skill acquisition and applicability among allied heath students such as optometry and physiotherapy trainees who frequently interact with the patients in both clinical and community settings. Training these students is crucial as they often serve as the first responders in outpatient facilities, vision screening camps, and community outreach programs. Recognizing this need the present quasi experimental study was conducted with the objective of assessing the knowledge, skill acquisition and effectiveness of COLS training among the optometry and physiotherapy trainees in real time execution of COLS protocol in emergency scenarios.

Materials and Methods

This quasi-experimental one group pre-test post-test only study was approved by the Institute Ethical Committee (Ref No. IECPG-118/28.02.2019). The study was registered at clinical trial registry of India (CTRI/2019/06/019910). The study was conducted from January 2024 to September 2024. The study includes 220 optometry and physiotherapy trainees from across pan India, attending the educational programme in a tertiary care institute of North India. Participants above 18 years of age who can read, write and understand English, never undergone any kind of COLS training in their lifetime and willing to participate were included in the study. Participants were provided with a participant information sheet for the study protocol and any queries were answered.

A structured demographic data sheet and a validated knowledge assessment questionnaire based on COLS guidelines as per IRC were administered to all the participants after the enrolment for the session. The knowledge assessment questionnaire was a validated multiple choice 15 items self-developed structured questionnaire. The questionnaire was prepared in English and then translated into Hindi language and validated by the language experts. The reliability of the questionnaire was established by the test-re-test method and Karl Pearson's correlation coefficient was calculated as 0.92. The maximum possible knowledge score was 15 and the minimum 0. A score above 80% was considered as adequate knowledge. The baseline knowledge related to COLS was first assessed before beginning the session and later was assessed at the end of session to compare the effectiveness of the session.

An educational program was conducted to share the information related to the introduction to the basics and functioning of heart, the difference between heart attack and cardiac arrest, the importance of COLS in cardiac arrest, identification of a victim in cardiac arrest and steps of COLS as per IRC guidelines, followed by a hands-on skill training for COLS. The interactive session was based on standard guidelines of IRC in a PowerPoint presentation; displayed on a laptop screen followed by a manikin based live demonstration by the IRC trained instructors with an approximate duration of the session for 2 hours with 15-20 minutes gap for discussion and answering queries related to the topics.

Following that, Hands on skill session was introduced to the participants with demonstration of COLS. Each participant was given 30 minutes to practice on manikin under closed supervision of the instructor. After the practice session, participant's skills were assessed using COLS skill assessment checklist developed by the researcher in accordance with the IRC algorithm and guidelines. The checklist, which showed an inter-rater reliability of 94%, comprised four domains: scene safety (1 item), early recognition and activation (10 items), quality chest compressions (8 items), and response check after 5 cycles of compressions (1 item). Each skill was scored as 2 for correct performance, 1 for partial performance, and 0 if not performed, with competency defined as achieving 100% performance across all domains. Participants who did not attain full competency on their first attempt were provided with remedial training and retested until they achieved 100% performance. For the assessment, each participant randomly selected a standardized case scenario, which was explained to them, and then demonstrated COLS skills individually on a manikin under the evaluation of an independent instructor.

Later, the post intervention knowledge was assessed using the same pre-test knowledge questionnaire after the skill session and feedback on the COLS training was collected using a structured proforma designed by the researcher.

Statistical method and data analysis

A total 220 participants attended the session. The data was analysed using IBM SPSS 27.0. Frequency and percentage were used to analysed the demographic data and COLS skill assessment. Paired t-test was used to compare the pre-test and post-test knowledge score and a value of <0.05 was considered as significant.

Results

Among 220 participants who attend the session, the mean age of the participants was 27.18± 9.49. Among all the participants 97 (44.1%) were male and 123(55.9%) were female. Out of 220 participants, 190 were optometry trainees and 30 were physiotherapists (Table 1).

At the baseline, all the participants had inadequate knowledge regarding COLS (4.15±2.4) that improved significantly after training (15.30±2.85) at (p= 0.001*) which was significant at $p<0.05$ (Table 2).

COLS skills were assessed using the COLS checklist and the participants were observed for every step performed. All steps were mandatory to be performed by all the participants correctly and achieve 100% competence in performing COLS (Table 3). In the first attempt, 195 participants ensured scene safety correctly, while 18 performed it partially and 7 did not perform it. In early recognition and activation, 189 checked the victim's response, 202 shouted for help, 199 dialled the emergency number, and 185 identified themselves. Identification of location was correct in 203 participants, while details such as number of victims (180), age (182), gender (189), number of rescuers (206), and ensuring to hang up the call (211) were performed with varying accuracy.

For chest compressions, correct heel placement was achieved by 182 participants, interlocking of fingers by 179, and elbow posture maintained by 189. Depth of chest

compressions was correct in 177, while 186 maintained the correct rate. Five cycles of compression were completed by 180 participants, complete recoil by 192, and minimal interruptions by 201. The victim's response after five cycles was checked by 196 participants. All those who performed the steps incorrectly or partially were given remediation and repeat demonstrations until the skills were mastered.

In the second attempt, marked improvement was observed across all domains. For example, 214 participants ensured scene safety correctly, 218 checked the victim's response, and 213 performed compressions at the correct depth. Almost all other checklist items also reached near-complete accuracy, with only a few participants still performing partially. These participants were retrained until they could demonstrate full competence.

By the third attempt, all 220 participants performed every checklist item correctly, including scene safety, victim recognition, emergency activation, chest compressions, and response check, thereby achieving 100% competence in COLS performance.

After the session, feedback received from the participants revealed the strong acceptability of the COLS training. All participants acknowledged its importance, expressed willingness to attend similar programs in the future, and showed enthusiasm to motivate their family members and neighbours to undergo training. Notably, 202 participants reported confidence in applying COLS to a cardiac arrest victim, while 18 indicated readiness to perform it on their relatives or acquaintances, and among all, 196 expressed willingness to assist a stranger. Although the overall response was highly positive, participants also identified certain barriers like fear of causing harm to the victim, fear of making mistake and anxiety related to the situation, that could potentially limit their ability to perform COLS in real-life situations (Table 4). These insights emphasize both the effectiveness of structured training in enhancing confidence and the need to address perceived barriers to strengthen community-level preparedness in cardiac emergencies.

Discussion

Compression -only Life Support (COLS) structured training, using the lecture method followed by hands on session and return demonstration for an optimal time was effective in increasing the knowledge and skills regarding COLS among the allied healthcare professionals.

Hands-only CPR and Compression-Only Life Support (COLS) provide a simplified, algorithm-based approach for teaching cardiopulmonary resuscitation (CPR) [1]. Such structured training modules are easy to comprehend and practice, particularly for laypersons and allied healthcare professionals with no medical background or prior CPR experience. In the present study, COLS skill competence was achieved by 85% of participants on the first attempt and by all participants after three attempts, which is encouraging for individuals exposed to this training for the first time. This success can be attributed to the use of a simplified COLS algorithm, explained in clear and understandable language, coupled with hands-on practice. Comparable findings have been reported by Kerketta *et al* 2023, Mawar S *et al*. 2021, Deepika et.al 2021 [9, 10, 11] among allied healthcare professionals and students in COLS techniques.

The current study also identified skill areas requiring greater emphasis during COLS training. Most participants performed basic steps such as ensuring scene safety, checking the victim's response, calling for help, identifying the location, and rechecking the victim's response with accuracy. However, chest recoil, a more technical component, was not achieved by four participants. Similar trends were observed by Ali S *et al*., [12] where scene safety, call for help, and response checks were well executed, while chest recoil was correctly performed by 71% of participants compared to 87% in the present study. This difference may be explained by training design: our study included demonstrations with hands-on sessions and adequate practice time, whereas in Ali's study, the training was limited to a nine-minute demonstration on a manikin. For laypersons without prior CPR knowledge, such a brief duration may be insufficient to absorb and practice all steps. Hence, adequate time for assimilation and practice is essential for skill acquisition.

Chest compressions remained the most challenging skill, requiring additional practice and reinforcement. This component is technically demanding and involves specific psychomotor coordination, achievable only with repeated practice. Trainers should therefore emphasize chest compression techniques by providing extended practice opportunities. Although a clear gain in knowledge and skills was observed, follow-up to assess long-term retention was not undertaken, as it was beyond the scope of this study. International CPR training bodies mandate periodic retraining to address the well-recognized decline in CPR knowledge and performance over time. Supporting this, a study conducted among schoolchildren in Mumbai highlighted the importance of regular revision to sustain CPR competence [13].

Participant feedback indicated high acceptability and willingness to perform COLS. More than 98% expressed readiness to perform chest compressions on family members or acquaintances, consistent with findings from other studies [14-16]. Importantly, most participants also reported willingness to perform COLS on strangers, attributing this to increased confidence and a desire to save lives. Chen M *et al*. reported that 76.3% of participants in their study were willing to perform CPR on strangers [17]. In the Indian context, the Good Samaritan Law, which protects bystanders from legal and procedural liability when helping accident victims, may partly explain the higher willingness observed in our study.

Nevertheless, some barriers to performing chest compressions were identified, including fear of making mistakes, fear of causing harm to the victim, and anxiety. Similar barriers have been described by Jarrah S *et al*. (15).

The strength of the present study lies in its focus on building community preparedness, an urgent public health priority to improve survival outcomes in out-of-hospital cardiac arrest through timely initiation of COLS. Integrating COLS training into allied health curricula could foster a cadre of confident, community-ready bystanders capable of timely life-saving interventions.

Expanding such training to diverse groups, including teachers, schoolchildren, police, traffic personnel, drivers, and security staff, is recommended. Emphasis should be placed on technical skills such as chest compressions, with sufficient hands-on practice and periodic refresher sessions to maintain competency.

Future studies could also evaluate varied teaching methods and reinforcement strategies. Recognizing the importance of layperson preparedness, the Indian Resuscitation Council (IRC) has initiated nationwide campaigns such as *World*

Restart a Heart Day to scale up COLS awareness and participation [8].

The study, however, had certain limitations. COLS skills were assessed in a defined setting; actual emergencies may be influenced by panic, environmental constraints, or lack of support, which could hinder performance. In addition, long-term retention of skills was not assessed. Reinforcement of COLS training at periodic intervals is therefore crucial to sustain competence and ensure that a larger section of the community is prepared to deliver life-saving chest compressions when needed.

Conclusion

The study demonstrates that allied health care professionals including optometry and physiotherapy trainees, can effectively acquire Compression-Only Life Support (COLS) skills through structured, hands-on training using a simplified algorithm. While most participants demonstrated competence in core skills during the first attempt, repeated practice was essential to master technically demanding components, particularly chest compressions. The training was well-received, with participants expressing confidence and willingness to perform COLS for both relatives and strangers. These findings highlight the potential of integrating COLS training into the curriculum for allied health care professionals and students to strengthen community-level emergency preparedness and improve outcomes in out-of-hospital cardiac arrests.

Data availability

All the data related to the study can be accessed on request from the principal investigator

Conflict of interest

None.

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