Original Research Article

Knowledge and awareness of basic life support among MBBS students in tertiary care hospital in Uttar Pradesh

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ABSTRACT

Background: Every medical student in India have to undergo a compulsory rotatory internship for completion of their course where they encounter various medical emergencies and apply their medical knowledge. An early encounter to a basic life support course and training will increase the efficacy of cardiopulmonary resuscitation and thus the outcome of the patient. This study was designed to test knowledge of MBBS students in a tertiary care hospital.

Methods: This observational study was conducted in a tertiary care hospital in Uttar Pradesh and used a preformed validated questionnaire to test awareness and knowledge of basic life support and cardiopulmonary resuscitation in a sample of 500 MBBS students. Descriptive analysis was performed on the questionnaire responses. All data obtained from the questionnaire was evaluated and statistically analysed using software IBM SPSS Statistics software version 24 (IBM Corp., Armonk, NY, USA) for MS windows.

Results: With a response rate of 47% among 500 MBBS students, the mean score obtained was 2.34 ± 1.066 out of a maximum score of five. A maximum score of 2.804 ± 1.055 obtained by 5th-year students. Surprisingly, first-year students achieved an average score of 2.66 ± 0.97, which was higher than that of 2nd, 3rd, and 4th year students. 87% of students were like-minded to participate in the cardiopulmonary resuscitation (CPR) awareness program. Only 45% of students correctly answered the order of CPR as C-A-B (chest compression-airway-breathing).

Conclusions: The study showed that though the awareness and importance of basic life support (BLS) are high among the medical students, the accurate knowledge required in performing BLS is inadequate. This study also showed that the National medical commission has taken a positive step in the incorporation of BLS in the curriculum.

Keywords: CPR, Medical student, Observational study, Prospective study, Survey, Tertiary care hospital

INTRODUCTION

According to World Health Organisation (WHO), an estimated 17.9 million (31%) deaths annually are attributed to cardiovascular diseases (CVDs), the leading cause of mortality worldwide In India, ischemic heart disease (IHD) is the major cause of death, followed by chronic obstructive pulmonary disease (COPD), and stroke.[1,2] Multiple studies have stated that in developing nations like India, deaths tend to occur in the younger population in their most productive midlife years, with 21% being less than 50 years.[3-5]

The cardiac arrest follows an ineffective contraction of the heart, which leads to decreased blood circulation and, subsequently, oxygen supply to the whole body. This can cause irreversible brain injury due to generalized

ischemia, leading to respiratory depression, giving the patient and healthcare providers a narrow window of 10 minutes between life and death.[6,7] Chances of survival after cardiac arrest decrease by 10% with every minute of delay in basic life support and public access to an automated external defibrillator (AED), hence only a small fraction of patients can be saved undergoing Out-of-Hospital Cardiac Arrest (OHCA).[4,8]

According to the American Heart Association (AHA), "cardiopulmonary resuscitation (CPR) is an emergency lifesaving procedure performed when the heart stops beating. Immediate CPR after cardiac arrest can double or triple chances of survival".[9] Basic life support (BLS), which was aimed initially for healthcare workers, is now being extended to educate the public. Studies have concluded that education about BLS and CPR enhances the success rate of bystander CPR.[10] This ensures that even non-healthcare workers can contribute to identifying an event of cardiac arrest and perform BLS to help save a life.

Adequate knowledge and awareness about BLS and CPR prepare an individual to respond to emergency life-saving measures. Several surveys conducted in different parts of the world have concluded that the level of knowledge and attitude of healthcare professionals towards BLS and CPR is inconsistent.[11] Studies have indicated that low bystander CPR rates can be attributed to inadequate CPR knowledge, anxiety regarding harming the patient, and unwillingness to provide mouth-to-mouth respiration.[7,9]

To the best of the author's information, there is no literature available regarding the attitude and knowledge about BLS, in the eastern part of Uttar Pradesh. Therefore, this survey aimed to check awareness and test knowledge of basic life support (BLS) and cardiopulmonary resuscitation (CPR) among MBBS students in a tertiary care hospital in Uttar Pradesh. The secondary objectives were to explore the reason for not taking CPR courses, lack of knowledge related to CPR and BLS, and low bystander CPR rate will also be explored.

METHODS

The present cross-sectional study was conducted among students of a medical college in eastern Uttar Pradesh,

India. The study protocol was presented before the Institutional Ethical Committee (IEC), and ethical clearance (EC No.: Dean/2020/EC/1868 Dated 21.02.2020) was obtained. Before enrollment in the study objectives of this study were explained and written informed consent was taken from all participants. The questionnaire was circulated through Google forms to every participants.

A total of 500 MBBS students, including interns attending medical college, participated in the study. A questionnaire was circulated between December 2019 to January 2020 through Google forms to evaluate the knowledge and awareness of medical students towards BLS and CPR. This questionnaire was originally made by students of Kasturba medical college (KMC), Manipal, Karnataka, India.[12] which was later used in a study in Turkey and was copyrighted by © 2017 Turkish Society of Cardiology and licensed under a Creative Commons Attribution-Noncommercial 4.0 International License.[13,14] Few questions were added from an online pretest for BLS and only minor changes were made in this questionnaire as most of the statements were according to the recent guidelines of the American Heart Association.[15] Towards preparing the questionnaire, a pilot study was conducted on 10 students after taking verbal consent and was recorded. Their response was analysed in the presence of BLS instructor and questionnaire was designed. A questionnaire was again applied to 10 students and was modified before it was finalized.

The questionnaire shown in Table 1 was in the English language and comprised of four subsections: the first section consists of demographic data including age, gender, and academic year. The second section-included questions assessing the attitude and thoughts of students towards cardiopulmonary resuscitation and its significance in clinical practice. The third section consisted of five multiple-choice questions addressing theoretical knowledge of goals and accuracy of CPR among students which were scored with points given to correct answers, and no points were given for incorrect answers; the last section comprised of questions targeted towards various methods, effectiveness, and an indication of CPR. Few questions were negatively reframed in the original questionnaire to test the depth of knowledge and avoid any bias. No changes were made in those questions.

Table 1: Questionnaire.

A) General questions to know the importance of CPR in clinical practice.			
1.	I am aware about importance of CPR in clinical practice	Agree	Disagree	Neutral
2.	According to me, knowledge about correct CPR procedure is mandatory to all health care professionals and it should be made compulsory.	Agree	Disagree	Neutral
3.	I believe CPR is a basic emergency need for the betterment of mankind and health status.	Agree	Disagree	Neutral
4.	I would like to participate in CPR awareness programs and have a lifesaving experience.	Agree	Disagree	Neutral
5.	I believe that CPR procedure is arduous, unethical, incorrect and purely inhuman	Agree	Disagree	Neutral
6.	Rather than being beneficial, it is more harmful to the patients	Agree	Disagree	Neutral

Continued.

A) General questions to know the importance of CPR in clinical practice.			
7. Conducting CPR is a simple waste of manpower and time	Agree	Disagree	Neutral

B) The main goal and accuracy of cardiopulmonary resuscitation (CPR) intervention. This study includes both correct and incorrect statements (This section also contain multiple-choice questions)

1. The current order of updated cardiopulmonary resuscitation (CPR) intervention for all age groups except newborns is

a	Airway, Breathing, Chest compression (ABC)
b	Chest compressions, Airway, Breathing (CAB)
c	Airway, Chest compression, Breathing (ACB)
d	Breathing, Chest compression, Airway (BCA)

2. The recommended universal compression to ventilation ratio with a compression rate of at least 100 per minute in all groups is (more than one may be correct)

a	30:2 for adults, children and infants if only a single rescuer is present
b	15:2 in children and infants if at least 2 rescuers are present
c	3:1 in newborns unless a cardiac cause is known

3. Regarding the chest compression, the following procedure is recommended (more than one may be correct)

a	Depth in adult and children is about 5cm (2 inches)
b	In infants it is 4 cm (1.5 inches)
c	In adults rescuers should use two hands for the chest compressions
d	In children rescuer should use one hand
e	With infants two fingers (index and middle fingers)

4. What are the BLS (basic life support) steps used for adults?

a	Assess the individual, give two rescue breaths, defibrillate, and start CPR
b	Assess the individual, activate EMS and get AED, check pulse, and start CPR
c	Check pulse, give rescue breaths, assess the individual, and defibrillate
d	Assess the individual, start CPR, give two rescue breaths, and defibrillate

5. The purpose of cardiopulmonary resuscitation (CPR) (more than one may be correct)

a	Restart the heart
b	Restore oxygenated blood to the brain
c	Prevent permanent brain damage
d	Delay tissue death
e	Maintain cardiac output to keep vital organs alive
f	Allow the heart to remain responsive to defibrillation attempts
g	Circulate oxygenated blood

C) Indications, methods, and effectiveness of cardiopulmonary resuscitation

|				
1.	CPR is an emergency procedure which is attempted in an effort to return life in cardiac arrest	Yes	No	May be
2.	CPR is always attempted inside the hospital setting	Yes	No	May be
3.	CPR is generally only effective if performed within 6-7 minutes of the stoppage of blood flow to vital organs	Yes	No	May be
4.	Artificial respirations are more appropriate than CPR if a person is not breathing but has a palpable pulse (i.e. respiratory arrest)	Yes	No	May be
5.	On average, 85-90% of people who receive CPR survive if conducted by experienced personnel	Yes	No	May be
6.	The brain may sustain damage after blood flow has been stopped for about 4 minutes and irreversible damage after about 7 minutes	Yes	No	May be
7.	According to the recent survey, people with no connection to the victim are more likely to perform CPR than a member of their family	Yes	No	May be
8.	If blood flow ceases for >10 hrs, virtually all cells of the body dies	Yes	No	May be
9.	CPR is generally continued until the person regains return of spontaneous circulation or is declared dead	Yes	No	May be
10.	A defibrillator is an electrical device used to deliver a shock to the heart and needed to restore a viable or "perfusing heart rhythm"	Yes	No	May be
11.	Compression-only CPR by the lay public is recommended to an adult having a cardiac arrest out of hospital	Yes	No	May be
12.	The survival rate is very high if immediate CPR is done followed by defibrillation with 3-5 minutes of sudden cardiac arrest	Yes	No	May be
13.	Compression-only CPR is less effective in children than in adults, as cardiac arrest in children is more likely to have a non-cardiac cause	Yes	No	May be
14.	It is always better to be calm and contented while conducting CPR rather than look frightened	Yes	No	May be
15.	CPR is often severely misrepresented in movies and television as being highly effective in resuscitating a person who is not breathing and has no circulation	Yes	No	May be

The sample size was calculated using:

$$n = \frac{\left[\frac{z^2 \times p(1-p)}{e^2}\right]}{\left[1 + \frac{z^2 \times p(1-p)}{e^2 N}\right]}$$

[Where, N = population size (approximately 500); e = Margin of error (percentage in decimal form) (5%); z = z-score (1.96)]. The minimum required sample size, at a confidence interval of 95%, with a margin of error of ±0.05% and an expected sample proportion of 0.5, was 218.

All data obtained from the questionnaire was evaluated and statistically analyzed using software IBM SPSS Statistics® (Statistical Package for Social Sciences) software version 24 (IBM Corp., Armonk, NY, USA) for MS windows. Quantitative variables, including scores obtained, were presented as means and standard deviation. Discrete data were presented as counts and percentages. Correlation tests were applied to see the relationship between the scores obtained. A p value <0.05 was defined as statistically significant.

RESULTS

Out of 500 medical students, 232 completed the survey over a period of a month resulting in a response rate of 47%. To increase participation reminder emails were sent to students and their e-mail id were collected to avoid multiple responses from the same individual. These responses were selected for statistical analysis. Of these 232 respondents, 160 (69%) were males, and 72 (31%) were females with a male-to-female ratio of 2.22:1 Figure 1. The distribution of participants according to their age, gender, and academic year is shown in detail in Table 2.
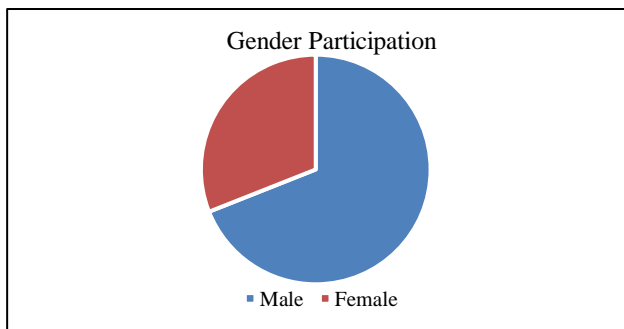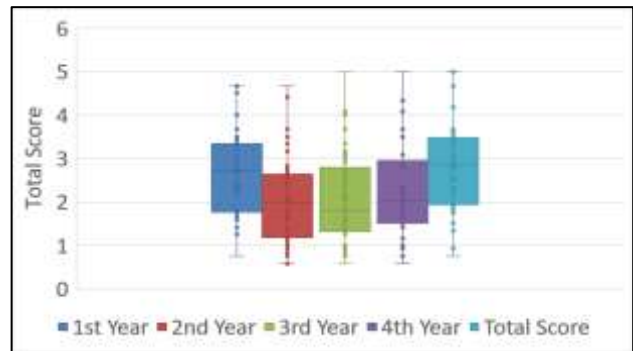

Figure 1: Division of participants as per gender.

The mean score obtained was 2.3±1.1 out of a maximum score of 5. Thirty-one per cent of the students were below 33rd percentile, while only 24% of the students were above the 75 percentile marks. Distribution of scores, according to academic years, is shown in Figure 2, with a maximum score of 2.8±1.0 obtained by 5th-year students. Surprisingly, first-year students achieved a score of 2.6±0.9, which was higher than students of 2nd, 3rd, and 4th year.

Table 2: Distribution of participants as per gender, age, and academic year.

Gender	1st year	2nd year	3rd year	4th year	5th year (Internship)	Grand Total
Male	33	38	35	24	30	160
17-20	32	29	10	2	2	75
20-24	1	9	24	22	26	82
25-30			1		2	3
Female	7	18	23	10	14	72
17-20	5	12	5			22
20-24	2	6	18	10	14	50
Grand total	40	56	58	34	44	232

Figure 2: Scatter plot of total score of various academic year.

Responses of students to the second section of the questionnaire about the importance of CPR in clinical practice are shown in Figure 3. Ninety-eight percent of students believed that CPR training should be made compulsory to healthcare professionals. Eighty-seven percent of students were like-minded to participate in the CPR awareness program. Questions like "CPR is harmful to patients" were framed negatively to which 83% of students responded with a 'NO'. However, 15% of students differed by saying "maybe" and 2% accepted the statement.
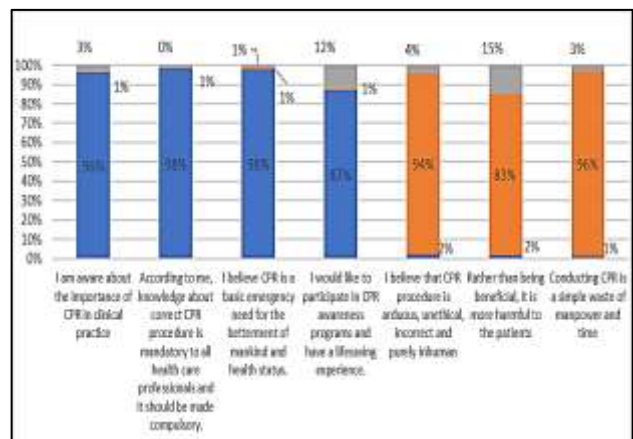
Figure 3: Importance of CPR in clinical practice.

Responses to the third section are described in Figure 4 contained multiple-choice questions with more than one correct response to test the depth of knowledge of students. Twenty-five percent of the students answered correctly to those questions. American heart association (AHA) updated its correct order of CPR from A-B-C to C-A-B in 2010, but 55% of the students were not able to answer correctly. Universal compression to ventilation ratio for adults was correctly answered by 70% of students, while for children were correctly answered by 60% of students. Only nine percent of students correctly answered regarding the depth of compression in adults, children, and infants shown in Figure 5.
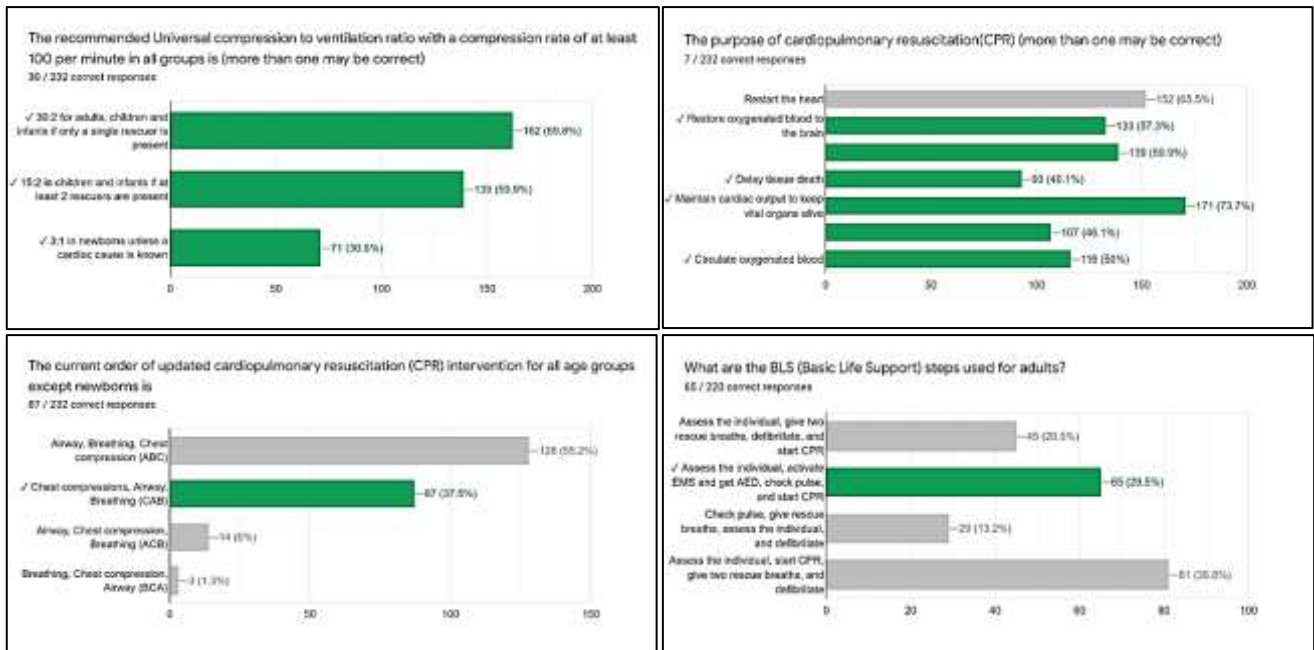

Figure 4: Questions to test knowledge of CPR.

Table 3: Indications, methods, and effectiveness of cardiopulmonary resuscitation.

	Question	Yes	No	Maybe
1	CPR is an emergency procedure which is attempted in an effort to return life in cardiac arrest	84%	9%	7%
2	CPR is always attempted inside the hospital setting	6%	87%	7%
3	CPR is generally only effective if performed within 6-7 minutes of the stoppage of blood flow to vital organs	58%	8%	34%
4	Artificial respirations are more appropriate than CPR if a person is not breathing but has a palpable pulse (i.e. respiratory arrest)	63%	14%	23%
5	On average, 85-90% of people who receive CPR survive if conducted by experienced personnel	62%	8%	30%
6	The brain may sustain damage after blood flow has been stopped for about 4 minutes and irreversible damage after about 7 minutes	79%	5%	16%
7	According to the recent survey, people with no connection to the victim are more likely to perform CPR than a member of their family	56%	9%	35%
8	If blood flow ceases for >10 hours, virtually all cells of the body dies	66%	11%	23%
9	CPR is generally continued until the person regains return of spontaneous circulation or is declared dead	76%	10%	14%
10	A defibrillator is an electrical device used to deliver a shock to the heart and needed to restore a viable or "perfusing heart rhythm"	94%	1%	6%
11	Compression-only CPR by the lay public is recommended to an adult having a cardiac arrest out of hospital	58%	18%	24%
12	The survival rate is very high if immediate CPR is done followed by defibrillation with 3-5 minutes of sudden cardiac arrest	84%	2%	13%
13	Compression-only CPR is less effective in children than in adults, as cardiac arrest in children is more likely to have a non-cardiac cause	59%	8%	34%
14	It is always better to be calm and contented while conducting CPR rather than look frightened	90%	3%	7%
15	CPR is often severely misrepresented in movies and television as being highly effective in resuscitating a person who is not breathing and has no circulation	67%	14%	19%
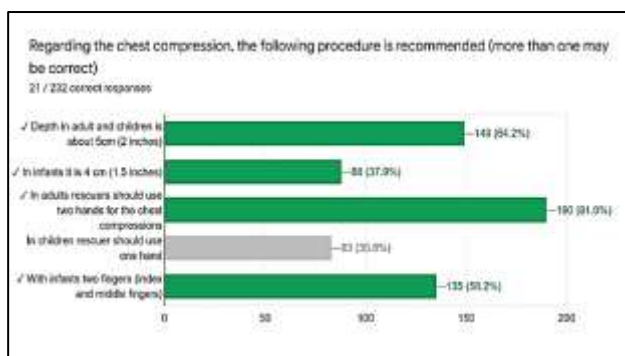
Figure 5: Chest compression rate.

Responses of students to section 4 of the questionnaire about indication, methods, and effectiveness of cardiopulmonary resuscitation are described in Table 3. Sixty-two percent of students believed that CPR is only successful if performed by an experienced individual while 30% deferred to this statement by choosing "maybe". Compression only CPR for layman though introduced by AHA in 1970, is still not valued as only 58% of students recommended it while 24% said "maybe".

DISCUSSION

Cardiovascular diseases are the most common cause of mortality in the world (WHO) and including India (CDC India).[16] Sudden cardiac death account for approximately 4280 deaths/100,000 population in India in contrast to 60-151 deaths/100,000 population in United States.[4]

Our study had a response rate less than 50%, which highlights the mindset of medical students towards the importance of BLS training; However, Eighty-seven percent of the participants stated that they would take part in a CPR awareness program, with 12% being in the doubtful area.

In our study, we have examined the awareness, knowledge, and practical skills regarding BLS of 232 medical students in a tertiary care hospital in UP, which included 1st (17.2%), 2nd (24.1%), 3rd (25%), 4th (14.6%), and 5th internship year (18.9%) students.

BLS course conducted by AHA takes a score of >80 percentage as adequate, hence by using this in our study, only 8% of students scored >80%. Based on this, we have concluded that medical students have inadequate knowledge, which aligns with the conclusion of previous studies about the same.[13]

We found that internship year students performed much better (mean score of 2.8±1.0) followed by 1st year (2.6±0.9) which can be attributed to the fact that students in the internship year have studied about CPR in their final year. Along with this, almost all of them have applied this theoretical knowledge in their practical

rotations in the hospital. Due to the new and updated NMC (National Medical Council) bill, which recently passed in the year 2019, we saw an improved performance by first-year students. This bill mandates that students should be exposed early on to emergency life-saving situations and their medical approach.[17]

American heart association (AHA) gave higher preference to chest compression by changing the sequence of resuscitation from A-B-C to C-A-B with compression: ventilation ratio from 15:2 to 30:2 more than ten years back.[18,19] However, in our study only 37.5% of the students answered the current sequence as chest compression, airway, and then breathing (CAB) with the majority (55.2%) stated it as airway, breathing, and then chest compression (ABC). This can be because of the ABC (airway, breathing, and circulation, similar to the acronym used in our questionnaire) algorithm in advanced trauma life support. Only 29.5% knew the correct sequence of BLS is to first assess the individual then activate EMS before starting CPR. Fortunately, the majority of the students knew the correct compression to ventilation ratio in adults, children, and infants with one rescuer (69.8%), and children and infants with two rescuers (59.9%). More than 80% of medical students justified the effectiveness of immediate CPR followed by defibrillation, and to be calm and composed while conducting CPR.

The majority of the students have agreed that CPR is important for clinical practice (96%), should be made compulsory (98%), and is used for the betterment of humankind (98%). They also agreed that CPR is not unethical or inhumane (94%), it's not harmful (83%), and that it is not a waste of time and manpower (96%).

Many studies in India reported that Sudden cardiac death (SCD) tends to occur more in the younger age group with a delayed presentation to the hospital (6 hours), and a lesser number of patients receive reperfusion therapy as compared to developed nations.[3-5] This is significant as the younger population of India (and any other developing country with similar socioeconomic status) contributes a significant amount to the nation's economy. It is substantial to prevent and figure out the cause behind this difference. For the time being, it is necessary to educate the layperson, usually being the first to witness an out-of-hospital-cardiac-arrest (OHCA), about the simple yet proven method to resuscitate a patient in cardiac arrest based on the algorithm provided by Indian resuscitation council (IRC) for compression-only life support.[4]

According to CARES study (conducted in the US), by-stander CPR rate was 33.3%, while in CARO study (conducted in North India), it was only 1.3%. This significant difference in India is due to a lack of awareness of basic CPR in communities.[20] CARES study also highlighted that a subgroup of OHCA patients that were not witnessed by EMS provider and received

bystander CPR had a higher rate of survival (11.2%) as compared to those who did not (7.0%) (p<0.001), confirming the importance of bystander CPR.[11] To improve the significantly low bystander CPR rate, we must first improve the knowledge of CPR among health care professionals, who would, in turn, be the counsellors for their community.

Eventually, medical students will encounter life-threatening situations, hence, it is of utmost importance to educate them about the importance and the practical skills required in performing high-quality CPR, as the difference between high-quality CPR and no CPR can mean the difference between life and death for the patients. There have been various literature citing the inadequacy of BLS knowledge among healthcare workers and even common citizens around the globe, but concerning Indian population, both medical and non-medical, there is scanty literature proving or disproving the same. We have only found a few articles that prove this statement and we have further added insight into the inadequacy of the knowledge in our medical community. Our study, even with its limitation, does prove that in accordance with global studies, the knowledge about BLS is inadequate in medical students.[21-23]

The present study ultimately shows that even though awareness and importance about CPR is high, accurate knowledge and practical skills about CPR based on current AHA guidelines are quite low, which is comparable to the study conducted by Vural et al.[13] The initiative undertaken by the NMC with earlier incorporation of emergency life-saving procedures in the medical curriculum is justified. Hence, before starting of the compulsory rotatory internship of interns in their respective hospitals, they must be required to obtain an accredited BLS certification.

Indian resuscitation council on occasion of world restart a heart day educated more than two lack individuals about compression-only CPR technique.[24] With help from the government of India and the health ministry of India, we can conduct similar campaigns involving medical students with an effort to improve the chest only compression rate by the layperson. Adding to the NMC curriculum, we can add rigorous training and assessment of the medical students concerning BLS and ask them to partake in various campaigns that occur in our country organized by a various organization like NMO, MSAI, etc. This would also increase the counselling ability of our students but on a broader scale would increase the bystander CPR rate, with special regards to compression-only CPR. We did find that the medical students are increasingly interested in partaking courses related to BLS and giving back to the community

This study was not free from various limitations. The convenience sample used in this study cannot be used to represent all health care professionals, as postgraduates, doctors, nursing, dental, Ayurveda, and other faculties may or may not have improved knowledge based on their curriculum and practice. We have presumed that even though the mode of education in the institute is English, and we used a relatively simple language in the questionnaire, some students may not have understood a few questions. We did not take into account those students who have recently or in the past taken a BLS certifying course, which may have influenced our score (something we did see as the improved score in 1st years). The mediocre response rate (47%) in our study, even though exceeding our calculated sample size, maybe a limitation, which could be due to limited interest in the topic. Finally, yet importantly, the use of theoretical questions may not correctly represent the proper practical skill required in performing BLS.

CONCLUSION

It is without a doubt that increasing the rate of bystander CPR could exponentially increase the survival rate of OHCA patients. However, we must first increase the awareness and knowledge about basic life support among health care professionals and subsequently their communities. BLS is one of the essential duties that each medical professional is bound to provide to society.

The present study shows that though the awareness and importance of BLS are high among the medical students, there is significant lack of knowledge about the accurate BLS technique, which is a huge concern, as the hospital is one of the major referral centres for eastern Uttar Pradesh, Bihar, and parts of Nepal. This study also shows that National Medical Commission (NMC) has taken a positive step in the incorporation of BLS in the curriculum. Still, we do require a much more stringent and stricter program with hands-on practice and regular assessments.

From this study, we achieved our primary objective but were not able to accomplish our secondary objectives. Similar studies must be conducted in various medical institutions to prove or disprove our results and to expand on our secondary objectives.

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