

Are High School Students Ready to Stop the Bleed from Injuries? Needs Assessment in a Low Resource Country

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Abstract

Background: Life-threatening bleeding is a major cause of trauma-related deaths. Stop the Bleed—Active bleeding control (ABC) program in Hyderabad recently showed that lay first responders can be effectively trained. However, the willingness of high school students to train in bleeding control is unknown. We report Stop the Bleed training needs assessment from high schools in India and estimate the potential multiplier effect. **Methods:** A cross-sectional survey was conducted from 12 randomly selected schools in Hyderabad. The study was to understand current knowledge, skills and willingness to get trained and respond to life-threatening bleeding from injuries. 107 Participants (35 Teachers and 72 students) were purposively selected for telephonic interviews with a structured questionnaire. **Results:** Response rate was 93% overall. 80% of participants have never been trained in bleeding control. 84% reported willingness to be trained, train others and help bleeding victims. All the teachers reported that stop the bleed training would be useful in high schools. 70.6% of teachers recommended that training could start from middle school (10 to 15 years), 47% preferred the online training mode. Only 20% of participants had prior training in lifesaving first aid and 32% did not know the number of emergency medical services (EMS). Each trained participant has the potential to train 3 to 4 people at the household level and perhaps more at the community level. **Conclusion:** The surveyed

schools in Hyderabad do not have the knowledge, skills, or training curriculum in Stop the Bleed. Students and teachers are willing to be trained and train others, with great potential for a “multiplier-effect” in the community.

Keywords

Active Bleeding Control, Road Traffic Injury, Needs Assessment, Training, Schools, Hyderabad, India

1. Background

Life-threatening bleeding is a major cause of trauma related deaths and disability (loss of limbs, functional impairment) in India [1]. Globally, studies have demonstrated that hemorrhage is responsible for 30% - 40% of trauma mortality [2] [3] [4]. A multi-center cohort study in India found that 58% of deaths due to trauma can be prevented with timely hemorrhage control combined with emergency medical team activation and response [5]. It is encouraging to see that studies conducted in the USA have demonstrated that high school students can be trained in hemorrhage control [6] [7] [8].

Stop the Bleed (named as Active Bleeding Control—ABC) pilot program conducted recently for lay public first responders in Hyderabad, India, showed that it is possible to train them to save lives. 1005 auto-rickshaw drivers, shopkeepers, tea sellers, petrol bunk workers, security guards were simulation trained as ABC volunteers. After the training, volunteers demonstrated all the 5 steps involved in the training—scene safety, calling for help, identifying life-threatening bleed, reassuring the victim, and controlling hemorrhage during the first few critical minutes. Until now 163 victims have been helped by trained rickshaw drivers [9]. There have been a few studies in India which analyzed the need for the stop the bleed training in trauma. These studies reported the necessity for training adult responders in bleeding control [10] [11] [12]. In a rural south Indian district, 81.4% of survey respondents did not have adequate skills to manage an emergency before training, but were willing to acquire knowledge and skills to help victims [10]. Stop the bleed training for adult healthcare providers (resident and attending physicians and nurses) showed encouraging results where 95% showed improved confidence and competence after the training, including wound packing and tourniquet application [11].

School children and teachers, if trained, can be valuable assets to the country in reducing the deaths from hemorrhage caused due to injury. Training school children can also lead to a “multiplier effect”—a student can train multiple households and community members after being trained in Stop the Bleed. Previous studies have demonstrated the applications of the multiplier effect in the field of public health. In bystander cardiopulmonary resuscitation (CPR), studies have demonstrated the effectiveness of various methods such as *pay it forward*

[13] and *distribution models* [14] where school students were trained by a self-instruction video kit and an inflatable manikin. Students were encouraged to take home the kit and train their friends, family, and neighbors. On average, 4.9 additional persons were trained per student in the “pay it forward” method and 2.9 persons in the “distribution model”.

There are no studies that examined the need for Stop the Bleed training among schools in India. Considering the high population density and proximity of school children to their communities [15] there is an additional opportunity for a multiplier effect from training teachers and students [16]. This study reports a Stop the Bleed training needs assessment and “multiplier effect” estimate from high schools in Hyderabad, India.

2. Methods

2.1. Study Design

A cross-sectional survey was used to assess school students and teachers in Hyderabad on their knowledge, skills, willingness to train, and help in stopping bleeding from life-threatening injuries.

2.2. Setting

The study was conducted in Hyderabad, India in June 2021. Twelve schools were selected randomly from the Hyderabad district (Population: 10 Million) [17]. Three types of schools were included in the study: Private, Central Government and Government aided.

2.3. Participants

Study participants (students and teachers) were recruited from 12 schools in Hyderabad. Indian Development Foundation (IDF) [18] reached out to schools as they work with school children in many community empowerment programs. School Principals provided the contacts of teachers; who then purposively selected students based on their willingness to participate. A total of 107 participants (35 teachers and 72 students) were selected for the study. The purpose of the study was explained, and verbal informed consent was obtained before data collection from all participants.

2.4. Tool

A structured questionnaire was designed by the ABC team (authors) for the teachers (17 questions) and students (10 questions) separately, based on published literature on training in injury-related bleeding control [6] [19] [20]. The questionnaire obtained information on knowledge, skills, and behavior related to stop the bleed, and willingness to be trained. The questionnaire also gathered inputs from the teachers regarding when, where, how, and to who the training should be conducted, and information to assess the potential multiplier effect (Annexure).

2.5. Data Collection

Considering the COVID-19 pandemic situation, telephonic interviews were carried out by a trained research associate in public health. Each call lasted for approximately 6 to 10 minutes. A participant was a “non-responder” if there was no response to 3 calls a day for three consecutive days. The responses were marked immediately by the study investigator in an excel spreadsheet.

2.6. Statistical Methods

Descriptive statistics were performed for all the variables such as self-declared ability to identify injury related life-threatening bleeding, willingness to train, usefulness of training, mode, venue, time for training and assessment of potential multiplier effect. Frequency and percentage were calculated for categorical variables. Continuous variables were summarized in terms of mean and standard deviation. Stata 14 was used to analyze the data.

2.7. Ethics Approval

This study has been approved by the Institute Ethics Committee of the Indian Institute of Public Health Hyderabad, India [21].

3. Results

3.1. Descriptive Summary of Participants

Out of 107, we had response from 99, the overall response rate was 93% (teachers 97%, students 90% response). Of the 99 responders, students were 65 and 34 were teachers. 74% of the students were from private schools, 19% belonged to central government schools and 7% of students were from government-aided schools. Students from grades 8 to 10 (12 to 15 years) participated in the survey. Out of 65 students, 31% were members of either the National Cadet Corps (NCC) or Scouts and Guides [22] [23].

Reasons for non-response included—mobile switched off (0.9%), invalid number (1.9%), loss of connection (0.9%), ringing but no response (2.8%), number not reachable (0.9%).

3.2. Self-Reported Stop the Bleed Knowledge, Skills, Behavior of Students and Teachers

One-third of the participants reported that they witnessed a road traffic injury (RTI) in the last 2 years. Most of the participants (80%) reported that they have not undergone any training in bleeding control. 84% are willing to undergo training and train others. On an average 3 to 4 people live in each household. 32% did not know the emergency ambulance service number (which is “108”). The internet was the major source (64%) of information on learning about bleeding control. 44% said that they can identify life-threatening bleeding. 69% of participants self-reported that they are confident in handling a bleeding victim until help arrives (**Table 1**).

Table 1. Self-reported Stop the bleed knowledge, skills, behavior of students and teachers.

Variable	Responses	Teachers	Students	Combined
		N = 34 N (%)	N = 65 N (%)	N = 99 N (%)
Witnessed Road Traffic Injury (RTI) in the last 2 years.	Yes	14 (41.2)	17 (26.2)	31 (31.3)
	No	20 (58.8)	48 (73.8)	68 (68.7)
Can identify any life-threatening bleeding.	Yes	17 (50)	27 (41.5)	44 (44.4)
	No	17 (50)	38 (58.5)	55 (55.6)
Knowledge of emergency phone number.	Yes	26 (76.5)	41 (63.1)	67 (67.7)
	No	8 (23.5)	24 (36.9)	32 (32.3)
Main sources of information on bleeding control.	TV	23 (67.6)	40 (61.5)	2 (2.0)
	Internet	2 (5.9)	5 (7.7)	63 (63.6)
	Mobile	9 (26.5)	18 (27.7)	7 (7.1)
	Others #	0 (0)	2 (3.1)	27 (27.3)
Previously trained in bleeding control.	Yes	9 (26.5)	11 (16.9)	20 (20.2)
	No	25 (73.5)	54 (83.1)	79 (79.8)
Confident in handling bleeding victims till the help arrives.	Yes	25 (73.5)	43 (66.2)	68 (68.7)
	No	9 (26.5)	22 (33.8)	31 (31.3)
Willing to undergo training in bleeding control.	Yes	31 (91.2)	52 (80)	83 (83.8)
	No	3 (8.8)	13 (20)	16 (16.2)
Willing to train others.	Yes	32 (94.1)	51 (78.5)	83 (83.8)
	No	2 (5.9)	14 (21.5)	16 (16.2)
Number of people in the house, other than the respondent.	-	3.3 (1.05)	3.6 (1.8)	3.5 (1.6) *

#Others—Books, journals, seminars, training, physical training teachers, family members, family doctors, from experiences. * Mean and standard deviation.

3.3. Response from Teachers Regarding When, Where and How to Train Students on Bleeding Control

All the teachers reported that stop the bleed training will be useful for students. 70.6% of teachers reported that training should start from middle school (10 to 15 years). 47% of teachers preferred the online mode of training followed by hybrid (35%) and face-to-face (18%). 97% of teachers preferred both teachers and students to be trained and 70.6% suggested inclusion of others such as support workers/janitors, bus drivers, attendants, school nurses. 53% of teachers preferred up to 1 hour of training and 62% preferred mornings. 56% preferred a training frequency of once/twice a week and 53% said open grounds in the school premises were ideal for training (**Table 2**) (**Figure 1**).

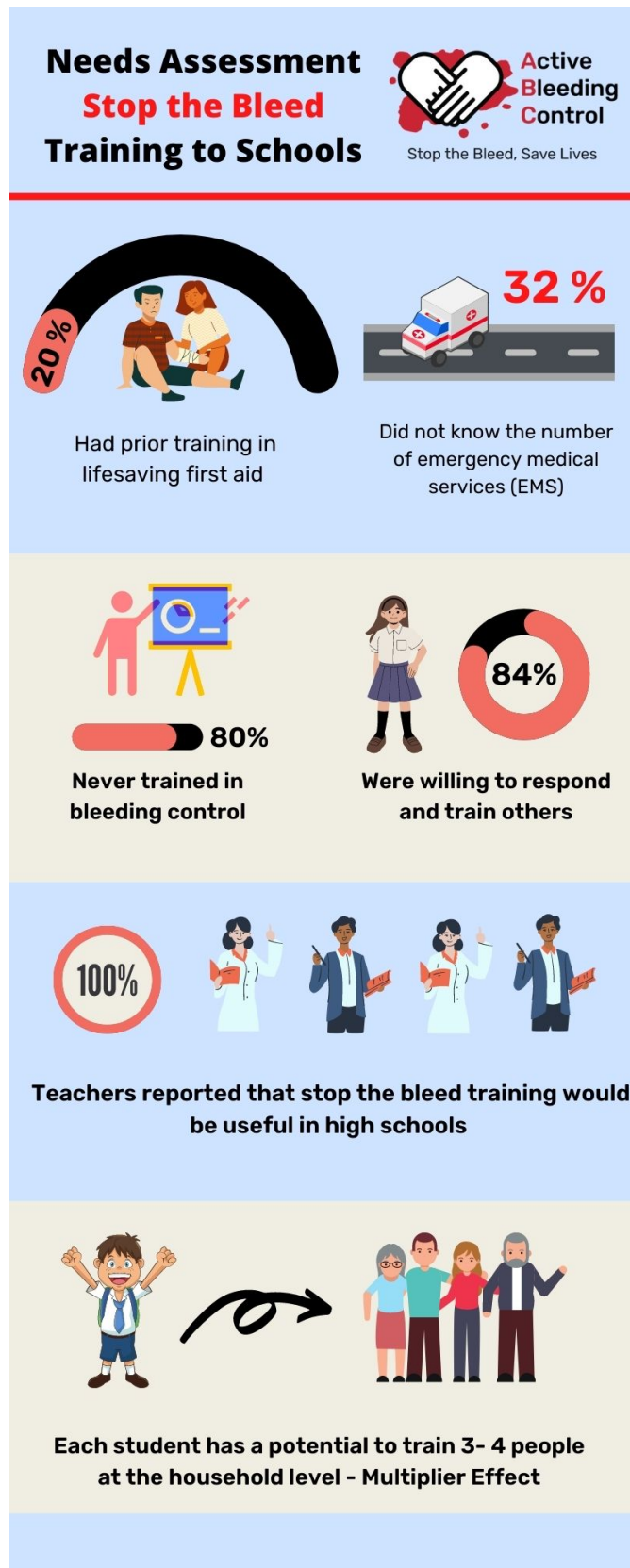


Figure 1. Summary of needs assessment stop the bleed training to schools.

Table 2. Response from teachers regarding when, where and how to train students on bleeding control (N = 34).

Variable (Training)	Categories	N (%)
Useful to students	Yes	34 (100)
	No	0 (-)
Grades to be included	Primary school (Grade 4)	8 (23.5)
	Middle school (Grade 5 to 7)	24 (70.6)
	High school (Grade 8 to 12)	15 (44.1)
Preferred mode	Online	16 (47.1)
	Face-to-face	6 (17.6)
	Hybrid	12 (35.3)
Who should be trained	Students	33 (97.1)
	Teachers	33 (97.1)
	Admin staff/bus drivers	28 (82.3)
	Others #	24 (70.6)
Duration	<1 hour	16 (47.1)
	1 hour	18 (52.9)
	2 hours	0 (-)
Frequency	Once/twice a week	19 (55.8)
	Once/twice a month	15 (44.2)
Preferred time	Morning	21 (61.8)
	Afternoon	3 (8.8)
	Evening	10 (29.4)
Preferred venue	Classroom	4 (11.8)
	School auditorium	12 (35.3)
	Open ground	18 (52.9)

Others—Physical training teachers, school nurse, class help, bus cleaners, caretakers/multipurpose workers.

4. Discussion

To the best of our knowledge, this is the first study in India to assess the knowledge, skills, willingness of school students and teachers to respond, be trained and disseminate training on stopping the bleed from serious injuries. This needs assessment was done before the rollout of Stop the Bleed (ABC) simulation training to school children; after seeing a high impact from training community lay responders previously from the ABC program [9]. All the teachers reported that stop the bleed training would be useful, especially since 80% of participants had never been trained.

Our study shows that on an average, 3.5 people live in the same house as the

study participant. It is encouraging that most (84%) of the participants are willing to get trained and train others in stopping the bleed. This has tremendous potential for a “multiplier effect” *i.e.*, each trained participant could potentially train a minimum of 3 to 4 people. This is a conservative estimate of the “multiplier effect” at the household level and is likely to be higher at the community level if friends and extended family members are included [13] [14] [24] [25]. Nearly 70% of the participants self-reported that they are confident in handling the bleeding victim till help arrives. However, ironically 56% said they cannot identify life-threatening bleeding related to injury. The possible explanations for this contradiction are—participants could have given socially acceptable answers, as found in other studies where self-reported rates are higher than observed rates [26]. The second possible reason could be that participants were more aware of how to handle minor cuts and injuries than managing life-threatening bleeding. Besides, 32% of participants did not know the emergency ambulance service number, indicating an opportunity for creating awareness regarding calling emergency ambulance and a genuine need for lifesaving Stop the Bleed training in schools.

Previous international studies have demonstrated the effectiveness of training high school students in bleeding control [6] [7] [8]. Elkbuli *et al.* from Miami USA demonstrated that 95% of students were comfortable applying a tourniquet after completing Stop the Bleed training [7]. Similarly, Sidwell *et al.* from Iowa USA demonstrated that 97% of the students in grades 6 to 8 could successfully pack a wound, hold pressure and apply a tourniquet. [8] Another study by Nanssy *et al.* from the northeastern region of USA revealed that stop the bleed course improved the perceptions of self-efficacy and preparedness of school during a life-threatening bleeding emergency among high school personnel ($p < 0.001$) [27].

All the teachers in our study thought that training students will be useful, and most of them (71%) emphasized that middle and high school students (10 to 15 years) should be trained in stop the bleed. Although some teachers preferred face-to-face training, almost half of them (47%) opted for an online mode of training and one-third for a hybrid mode, considering the current pandemic situation. As most of the participants cited that internet is the main source of information on injury related bleeding control, it is encouraging that we have the opportunity to create an online curriculum using internet to overcome the barrier of pandemic-related onsite training. Craig *et al.* from USA demonstrated effective bleeding control training to high school students through web-only and hybrid, in addition to face-to-face [6].

Our study also gathered information on recommended ideal time and venue for training. Teachers suggested that it would be ideal for students to spend 1 hour on training and anything more may affect their concentration. Teachers felt that students are already spending a lot of time on virtual classes and if the training is for a longer duration, it may increase their screen time. Mornings

were preferred for training and once or twice a week was considered optimum. For face-to-face training, school grounds were preferable, as many schools may not have an auditorium and even if they did it is preferable to avoid closed room training considering the COVID-19 pandemic. Teachers felt that training should be inclusive. They suggested training administrative staff, physical training teachers, school bus drivers, school bus attendants, school watchmen, security guards, cleaners, class help, and support workers in addition to students.

Stop the Bleed training could improve the confidence and competence of the students and their families to help trauma victims at the crash scene, thereby promoting Good Samaritan culture. Majority (80%) of participants in our study have never been trained and most (84%) are willing to undergo training and train others. Each can potentially train 3 to 4 in a family with a huge opportunity for a multiplier effect to empower the community. A few studies have successfully demonstrated the multiplier effect after CPR training school children. A Danish study distributed 35,002 resuscitation manikins and a 24-minute instructional DVD whereby children were trained in CPR. Approximately every student could train 2.5 persons [25]. Similarly, a Norwegian study demonstrated that 2.8 extra persons were trained per kit brought home by high school students [24].

5. Strengths and Limitations

This study contributes to the limited literature related to Stop the Bleed training in schools from India as well as in other low-resource countries. Participants included both teachers and students. Inputs of teachers are useful for planning and implementation of training and their buy-in is essential for rolling out training. The high response rate of 93% minimizes potential non-response bias.

The study has some limitations. Students and teachers were selected purposively based on their interest in participating in the survey, leading to possible self-selection by motivated participants. Similarly, the multiplier effect is likely to be an underestimate because we only assessed the number of household members and did not include friends and extended family that each student commonly interacts with. Due to convenience sampling, the uniform representation in terms of private, government, and aided schools was not possible, thereby limiting the generalizability of findings to all schools in India. Knowledge and skills related to stop the bleed were self-reported by the participants, with a possible overestimation of their ability due to enthusiasm. The sample size is small, but it has given us useful information on the willingness to train, and pointers on how best to plan Stop the Bleed training in schools.

6. Conclusion

Training school children in Stop the Bleed from injuries have been successfully conducted in some high-income countries. Considering the paucity of such data and high mortality rates from injury in India, this study has obtained useful information from schools in Hyderabad, India. This study shows that high schools

in Hyderabad do not have the training or necessary knowledge and skills to Stop the Bleed. They are willing to be trained and to train others, leading to a great potential for a community “multiplier effect”. This needs assessment has been the key to help us to create both face-to-face as well as online simulation curriculum to train to Stop the Bleed in Indian schools. Ten schools from Hyderabad, India have now been enrolled for the lifesaving Active Bleeding Control (ABC) Project.

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Key Messages

What Is Already Known on This Subject

- Lay responders can be trained in Active bleeding control in India.
- Students have been trained in USA and other developed countries in stop the bleed successfully.
- CPR Studies have shown that it is possible to achieve multiplier effect in the community.
- There is no evidence from India on stop the bleed training needs among schools.

What This Study Adds

- This is the first study among schools in India to assess knowledge, skills and attitude related to Stop the Bleed.
- All the teachers responded that Stop the Bleed training will be useful. 80% of participants from our study have never been trained in stopping life-threatening bleed and majority (84%) are willing to undergo training and train others.
- This study has tremendous potential for a “multiplier effect”—minimum 3 to 4 people can be trained by each student at the household level.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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