INTRODUCTION

Cardiovascular diseases (CVDs) are the number one cause of death globally. According to the World Health Organization, about 17.3 million people died from Cardiovascular Diseases (CVDs) in 2008. This represented 30% of all the global deaths. Three-quarters of all deaths from myocardial infarction occur after cardiac arrest in the community. This proportion is even higher in people under 55 years of age, in whom 91% of cardiac arrest deaths occur out of the hospital. In these conditions, early Cardiopulmonary Resuscitation (CPR) and early defibrillation might be useful to improve the survival and neurologic outcomes.

Basic life support (BLS) is the foundation for saving lives following cardiac arrest. Fundamental
aspects of BLS include immediate recognition of sudden cardiac arrest (SCA) and activation of the emergency response system, early cardiopulmonary resuscitation (CPR), and rapid defibrillation with an automated external defibrillator (AED). All healthcare professionals are expected to have current knowledge of Basic Life Support (BLS) guidelines to revive unresponsive and cardiac arrest patients.

In the present study, we aimed to assess the knowledge, attitude, and practice about BLS among the doctors of 13 tertiary care hospitals in Rawalpindi and Islamabad, Pakistan.

METHODS

Junior doctors from 13 tertiary care hospitals of Rawalpindi and Islamabad, Pakistan were included in this study as the respondents. The doctors who have been working for less than four years in a hospital were considered as junior doctors. The sample size was calculated using widely used formulae $n = \frac{z^2 p(1-p)}{E^2}$. Since the prevalence rate was unknown, 50% prevalence was considered. At an alpha level of 5%, the required sample size was 384. In order to include the required samples, the researchers visited these hospitals during the morning, evening and night shifts to recruit as many junior doctors as possible. During the study duration, 364 junior doctors were inducted in the study out of which 317 returned the questionnaire with a response rate of 87.08%. The data was collected from April 2018 to October 2018 through a 37 items questionnaire related to demographic characteristics, knowledge, attitude, and practice of CPR among junior doctors. The questionnaire validation was done by two epidemiology professors. Researchers interviewed all the included doctors face to face with the questionnaire. Purpose of the current study was clearly explained to the interviewees. Informed consent was taken from each participant. Ethical approval was secured from Institutional Review Board of Poonch Medical College, Rawalakot, Azad Kashmir, Pakistan.

Statistical Analysis: Frequencies and percentages were used to present the demographic characteristics and CPR knowledge, attitude, and practice related questions and responses. The mean ± SD number of correct responses to all CPR related questions were presented. The mean number of correct answers were compared across the age groups, time since graduation and time since last CPR training by Kruskal Wallis H test.

The analysis was performed in 95% confidence interval using the Statistical Package for Social Science (SPSS), version 23.0 (IBM, Armonk, NY, USA).

RESULTS

Among the 317 total respondents, 171 (53.9%) were male and 258 (81.4%) were from age group 23 to 25 years. More than half had (54.6%) valid CPR training certificate. (Table-I)

The majority, 299 (94.3%) knew the abbreviation of 'BLS'. Ninety-eight percent respondents thought BLS training is necessary for the doctors. More than half (53.0%) knew the correct compression to ventilation ratio which is 30:2. Responses to the 13 CPR knowledge related questions, seven CPR attitude related questions and 11 CPR practice related questions were presented in Table-I, Table-II, and Table-III respectively. Mean number of correct answers for all 31 CPR questions for all respondents was 14.18 ± 0.15 with a minimum of seven correct answers and a maximum of 21 correct answers.

The mean number of correct answers for all CPR related questions was not statistically significantly different across the demographics. (p values > 0.05) (Table-V).

Table-I: Demographic characteristics of all respondents.

| Characteristics                  | N   | %   |
|----------------------------------|-----|-----|
| **Age of the doctors**           |     |     |
| 23-25                            | 258 | 81.4|
| 26-30                            | 52  | 16.4|
| 31-34                            | 7   | 2.2 |
| **Gender of doctors**            |     |     |
| Male                             | 146 | 46.1|
| Female                           | 171 | 53.9|
| **Time since graduation**        |     |     |
| Last year                        | 268 | 84.5|
| Last 2-3 years                   | 21  | 6.6 |
| Last 4-5 years                   | 12  | 3.8 |
| > 5 years                        | 16  | 5.0 |
| Doctor having valid CPR certificate | 173 | 54.6|
| **Time since last CPR training** |     |     |
| 1 year or less                   | 264 | 83.3|
| >1 to 2 years                    | 31  | 9.8 |
| >2 to 3 years                    | 9   | 2.8 |
| >3 to 4 years                    | 13  | 4.1 |
| Doctors attended CPR course      | 226 | 71.3|
### CPR knowledge and skills

Table-II: Answers to CPR knowledge related questions.

| Questions                                                                 | Responses                                      | N   | %   |
|---------------------------------------------------------------------------|------------------------------------------------|------|-----|
| 1. What is the abbreviation of “BLS”?                                      | a) Best Life Support                           | 11   | 3.5 |
|                                                                           | b) Basic Life Support                           | 299  | 94.3|
|                                                                           | c) Basic Lung Support                           | 3    | 0.9 |
|                                                                           | d) Basic Life Services                          | 4    | 1.3 |
| 2. When you find someone unresponsive in the middle of the road, what will be your first response? | a) Open airway                                 | 91   | 28.7|
|                                                                           | b) Start chest compression                      | 33   | 10.4|
|                                                                           | c) Look for safety                              | 190  | 59.9|
|                                                                           | d) Give two breathings                          | 3    | 0.9 |
| 3. If you confirm somebody is not responding to you even after shaking and shouting at him, what will be your immediate action? | a) Start CPR                                    | 153  | 48.3|
|                                                                           | b) Activate EMS                                 | 82   | 25.9|
|                                                                           | c) Put him in recovery position                 | 75   | 23.7|
|                                                                           | d) Observe                                      | 7    | 2.2 |
| 4. What is the location for chest compression?                             | a) Left side of the chest                      | 29   | 9.1 |
|                                                                           | b) Right side of the chest                      | 8    | 2.5 |
|                                                                           | c) Centre of the chest on lower half of breast bone | 211  | 66.6|
|                                                                           | d) Xiphisternum                                 | 69   | 21.8|
| 5. What is the location for chest compression in infants?                  | a) One finger breadth below the nipple line     | 162  | 51.1|
|                                                                           | b) At the intermammary line                     | 39   | 12.3|
|                                                                           | c) One finger breadth above the nipple line      | 31   | 9.8 |
|                                                                           | d) At Xiphisternum                              | 85   | 26.8|
| 6. How do you give rescue breathing in infants? a                          | a) Mouth-to-mouth with nose pinched             | 113  | 35.6|
|                                                                           | b) Mouth-to-mouth and nose                      | 98   | 30.9|
|                                                                           | c) Mouth-to-nose only                           | 19   | 6.0 |
|                                                                           | d) Mouth-to-mouth without nose pinched          | 87   | 27.4|
| 7. Depth of compression in adults during CPR                                | a) At least 2 inches                            | 123  | 38.8|
|                                                                           | b) 2½ – 3 inches                                | 141  | 44.5|
|                                                                           | c) 1 - 1½ inches                                | 42   | 13.2|
|                                                                           | d) 1½ inch                                      | 11   | 3.5 |
| 8. Depth of compression in Children during CPR                              | a) 2 inches                                     | 66   | 20.8|
|                                                                           | b) 2 - 2½ inches                                | 45   | 14.2|
|                                                                           | c) 1 - 1½ inches                                | 107  | 33.8|
|                                                                           | d) ½ - 1 inch                                   | 99   | 31.2|
| 9. Depth of compression in neonates during CPR                              | a) 1½ – 2 inches                                | 64   | 20.2|
|                                                                           | b) 2- 2½ inches                                 | 41   | 12.9|
|                                                                           | c) 1 inch                                      | 138  | 43.5|
|                                                                           | d) approximately 1½ inch                        | 74   | 23.3|
| 10. Rate of chest compression in adult and Children during CPR             | a) at least 100 / min                           | 137  | 43.2|
|                                                                           | b) approximately 100 / min                      | 81   | 25.6|
|                                                                           | c) 80 / min                                     | 60   | 18.9|
|                                                                           | d) 120 / min                                    | 39   | 12.3|
| 11. What does abbreviation AED stands for?                                 | a) Automated External Defibrillator             | 114  | 36.0|
|                                                                           | b) Automated Electrical Defibrillator           | 144  | 45.4|
|                                                                           | c) Advanced Electrical Defibrillator            | 40   | 12.6|
|                                                                           | d) Advanced External Defibrillator              | 19   | 6.0 |
| 12. What does abbreviation EMS stands for?                                 | a) Effective Medical Services                   | 17   | 5.4 |
|                                                                           | b) Emergency Management Services                | 152  | 47.9|
|                                                                           | c) Emergency Medical Services                   | 130  | 41.0|
|                                                                           | d) External Medical Support                     | 18   | 5.7 |
| 13. If you and your friend are having food in a canteen and suddenly your friend starts expressing symptoms of choking but responsive, what will be your first response? | a) Give abdominal thrusts                       | 121  | 38.2|
|                                                                           | b) Give chest compression                       | 26   | 8.2 |
|                                                                           | c) Confirm foreign body aspiration by talking to him | 61   | 19.2|
|                                                                           | d) Give back blows                              | 109  | 34.4|
Table-III: Answers to CPR attitude related questions.

| Questions                                                                 | Responses                        | N    | %    |
|---------------------------------------------------------------------------|----------------------------------|------|------|
| 14. Do you think BLS is necessary?                                        | Yes                              | 310  | 97.8 |
|                                                                            | No                               | 5    | 1.6  |
|                                                                            | Not sure                         | 2    | 0.6  |
| 15. If yes, how necessary it is?                                          | Very much important              | 273  | 86.1 |
|                                                                            | Important                        | 44   | 13.9 |
| 16. Have you ever voluntarily performed BLS?                              | Yes                              | 147  | 46.4 |
|                                                                            | No                               | 144  | 45.4 |
|                                                                            | Performed but not voluntarily    | 26   | 8.2  |
| 17. Would you perform mouth to mouth ventilation for person of same gender?| Yes                              | 188  | 59.3 |
|                                                                            | No                               | 71   | 22.4 |
|                                                                            | Hesitant                         | 58   | 18.3 |
| 18. Would you perform mouth to mouth ventilation for person of opposite gender? | Yes                              | 126  | 39.7 |
|                                                                            | No                               | 97   | 30.6 |
|                                                                            | Hesitant                         | 94   | 29.7 |
| 19. Would you like to undergo BLS training in a workshop / centre with hands on practice under supervision? | Yes                              | 288  | 90.9 |
|                                                                            | No                               | 27   | 8.5  |
|                                                                            | Not sure                         | 2    | 0.6  |
| 20. Do you think that BLS training should be a part of your curriculum?   | Yes                              | 301  | 95.0 |
|                                                                            | No                               | 8    | 2.5  |
|                                                                            | Not sure                         | 8    | 2.5  |

**DISCUSSION**

No doctor could give 100 percent the current answer according to our study. The highest percentage of correct answer given by a doctor was 68%. This study finding goes in line with a previous Indian study which included doctors, other health workers, and medical students. Knowledge regarding infant and children CPR in comparison with the adult CPR was shown to be poorer in this study (Table-II). This might be due to the overall prevalence of children cardiac arrest cases being lower than the adult cardiac arrest cases. Only 54.6% of doctors had valid CPR certificate in 13 tertiary care hospitals in Pakistan, whereas a study revealed 99% of the medical students received CPR training in UK.10

Interestingly, a fewer percentage of doctors would perform mouth to mouth breathing on the opposite gender (39.7%) compared to the same gender (59.3%) (Table-III). Gender based barriers still exist in the health care provision in Pakistan. The clear majority wanted to get hands-on BLS training and suggested BLS training to be included in the medical curriculum. This study encourages medical educationists to look at this matter. Because, trained doctors show better CPR related knowledge, attitude, and practice than the untrained doctors.12,13

This study showed the duration of medical practice improves knowledge, attitude, and practice score of CPR although not at a statistically significant level (Table-V). Similar and comparable findings were shown by a Malaysian study.14

**Limitation of the study:** The study was cross-sectional in nature therefore causality cannot be established. Data were only collected from the tertiary hospitals, which may not represent all the doctors of the country. Only the doctors were included in this study whereas CPR knowledge is essential for all the health workers. Awareness regarding ACLS protocol was not studied.

**CONCLUSION**

It is unacceptable to work in a hospital as a doctor without knowing how to perform a basic life-saving procedure like CPR. The current study raises question about how to improve the knowledge, attitude and, practice among the doctors who never had CPR training. Despite showing an overall poor knowledge most of the participants wanted to perfect the CPR steps. Hospitals should provide enough resources to ensure all its health workers learn and relearn BLS protocols.

**Recommendation:** This study recommends further studies to assess BLS and ACLS awareness among
### Table-IV: Answers to CPR practice related questions.

| Questions                                                                 | Responses                                      | N    | %    |
|---------------------------------------------------------------------------|-----------------------------------------------|------|------|
| 21. Which of the following is not included in the 5 links in the adult Chain of Survival? | a. Early CPR                                  | 50   | 15.8 |
|                                                                            | b. Integrated post cardiac arrest care        | 99   | 31.2 |
|                                                                            | c. Advanced airway placement                  | 74   | 23.3 |
|                                                                            | d. Rapid defibrillation                       | 94   | 29.7 |
| 22. How often should rescuers switch roles when performing 2-rescuer CPR? | a. After each cycle                           | 75   | 23.7 |
|                                                                            | b. After 2 cycles                             | 157  | 49.5 |
|                                                                            | c. After 5 cycles                             | 85   | 26.8 |
| 23. The initial Basic Life Support (BLS) steps for adults are:            | a. Assess the victim, give 2 rescue breaths, defibrillate, start CPR | 36   | 11.4 |
|                                                                            | b. Assess the victim, activate EMS & get AED, check pulse, start CPR | 151  | 47.6 |
|                                                                            | c. Check pulse, give rescue breaths, assess the victim, defibrillate | 39   | 12.3 |
|                                                                            | d. Assess the victim, start CPR, give 2 rescue breaths, defibrillate | 91   | 28.7 |
| 24. Where should you attempt to perform a pulse check in adult?           | a. Carotid                                     | 241  | 76.0 |
|                                                                            | b. Brachial                                    | 28   | 8.8  |
|                                                                            | c. Ulnar                                       | 44   | 13.9 |
|                                                                            | d. Temporal                                    | 4    | 1.3  |
| 25. The compression to ventilation ratio for the lone rescuer giving CPR to victims of ANY age is: | a. 15:1                                       | 44   | 13.9 |
|                                                                            | b. 15:2                                       | 64   | 20.2 |
|                                                                            | c. 30:1                                       | 41   | 12.9 |
|                                                                            | d. 30:2                                       | 168  | 53.0 |
| 26. The proper steps for operating an AED are:                            | a. On the AED, attach electrode pads, shock the patient, analyze the rhythm | 35   | 11.0 |
|                                                                            | b. On the AED, attach electrode pads, analyze the rhythm, clear the patient, deliver shock | 202  | 63.7 |
|                                                                            | c. Attach electrode pads, check pulse, shock patient, analyze rhythm | 42   | 13.2 |
|                                                                            | d. Check pulse, attach electrode pads, analyze rhythm, shock patient. | 38   | 12.0 |
| 27. The 2010 AHA Guidelines for CPR recommended BLS sequence of steps are: | a. Chest compressions, Airway, breathing      | 69   | 21.8 |
|                                                                            | b. Airway, Breathing, Check Pulse             | 91   | 28.7 |
|                                                                            | c. Airway, Breathing, Chest Compressions      | 135  | 42.6 |
|                                                                            | d. Chest compression, Airway placement, Breathing | 22   | 6.9  |
| 28. Which of the following is not a sign of severity of airway obstruction? | a. Poor air exchange                           | 83   | 26.2 |
|                                                                            | b. High-pitched noise while inhaling          | 63   | 19.9 |
|                                                                            | c. Unable to cry                               | 76   | 24.0 |
|                                                                            | d. May wheeze between coughs                  | 95   | 30.0 |
| 29. In an adult with an advanced airway in place during 2-rescuer CPR, breaths should be administered how often? | a. Every 5 seconds                            | 76   | 24.0 |
|                                                                            | b. Every 5-6 seconds                           | 113  | 35.6 |
|                                                                            | c. Every 6-8 seconds                           | 70   | 22.1 |
|                                                                            | d. Every 10-12 seconds                         | 58   | 18.3 |
| 30. The critical characteristics of high-quality CPR include which of the following? | a. Starting chest compressions within 10 seconds of recognition of cardiac arrest | 47   | 14.8 |
|                                                                            | b. Push hard, push fast                       | 40   | 12.6 |
|                                                                            | c. Minimize interruptions                      | 38   | 12.0 |
|                                                                            | d. All of the above                            | 192  | 60.6 |
| 31. Have you ever performed a CPR?                                       | Yes                                           | 229  | 72.2 |
|                                                                            | No                                            | 88   | 27.8 |
Table-V: Number of correct answers across the studied demographic characteristics.

| Characteristics                  | KAP score | p-value |
|----------------------------------|-----------|---------|
|                                  | Mean ± SD |         |
| **Age of the doctors**           |           |         |
| 23-25                            | 14.04 ± 2.78 | 0.211  |
| 26-30                            | 14.65 ± 2.52 |         |
| 31-34                            | 15.57 ± 3.21 |         |
| **Gender of doctors**            |           |         |
| Male                             | 14.38 ± 2.64 | 0.244  |
| Female                           | 14.01 ± 2.85 |         |
| **Time since graduation**        |           |         |
| Last year                        | 14.07 ± 2.82 | 0.376  |
| Last 2-3 years                   | 14.48 ± 2.50 |         |
| Last 4-5 years                   | 15.42 ± 2.87 |         |
| > 5 years                        | 14.69 ± 1.54 |         |
| **Doctor having valid CPR certificate** |   |         |
| Yes                              | 14.36 ± 2.61 | 0.148  |
| No                               | 13.95 ± 2.91 |         |
| **Time since last CPR training** |           |         |
| 1 year or less                   | 14.26 ± 2.67 | 0.090  |
| >1 to 2 years                    | 14.10 ± 2.86 |         |
| >2 to 3 years                    | 11.22 ± 3.19 |         |
| >3 to 4 years                    | 14.69 ± 3.12 |         |
| **Doctors attended CPR course**  |           |         |
| Yes                              | 14.07 ± 2.51 | 0.200  |
| No                               | 14.44 ± 3.30 |         |

all health workers of the country. This study also encourages the hospitals to provide mandatory CPR training to the health workers at free of cost.

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Authors’ Contributions:

SKG, AJ & FS: Worked on the concept and design of the study.

MHG, FZ: Collected the data.

AJ: Analyzed the data.

SKG: Approved the final version to be published.