

# Effectiveness of Virtual Teaching on Knowledge Regarding Electrocardiogram Interpretation Among Undergraduate Nursing Students

Radha K<sup>1</sup>, Mini Alex<sup>2</sup>, Prabha Agnibhoj<sup>3</sup>, Anurag Bhai Patidar<sup>4</sup>

## Abstract

*A nurse's ability to interpret an electrocardiogram (ECG) rhythm quickly and accurately is vital for good clinical outcome among critically ill patients. Improved knowledge of ECG interpretation will allow nurses to initiate appropriate interventions, which will save lives and improve the quality of healthcare delivery. COVID-19 pandemic has changed the mode of teaching and online teaching will be a norm in future. This study aimed to assess the effectiveness of virtual training programme on knowledge of ECG interpretation among nursing students. The research design for the present study was pre-experimental, one group pre-test/post-test design; 100 student nurses were recruited conveniently from the selected nursing colleges. Structured knowledge questionnaire containing 30 items was prepared in Google Forms for data collection. Virtual training was carried out through Zoom online platform. Online pre-test through Google form was carried out followed by virtual training and post test was conducted on day 7 after the training. Majority of students belonged to the age group of 19-21 years (84%). Pre-test revealed that 5 percent of nursing students had good ECG knowledge followed by 58 percent had average and 38 percent with poor knowledge Whereas in the post-test 29 percent had good knowledge, 63 percent had average and only 8 percent had poor knowledge. Virtual training significantly improved ( $p < 0.05$ ) the mean post-test knowledge score ( $16.89 \pm 5.27$ ) as compared to mean pretest knowledge score ( $12.78 \pm 4.34$ ). Further, there was no significant association between pre-test knowledge score and demographic variables. The results indicate that virtual training was effective in enhancing the knowledge on ECG interpretation among nursing students. Since these students will make up the future nursing workforce, improved interpretation of electrocardiogram will help improve the quality of health care delivery among critically ill and cardiac patients.*

Key words: Electrocardiogram, Knowledge, Virtual structured Teaching programme, Interpretation

Electrocardiogram (ECG) is the most frequently used diagnostic test for patients with heart disease. Proper interpretation contributes considerably to the diagnosis and management of patients with lethal cardiac dysrhythmia. Professional nurse is expected to make individualistic decision based on the situation of critically ill patients with cardiac dysrhythmia. Therefore, it is essential that nurses develop their skills and knowledge regarding the interpretation of electrocardiogram as it is the gold standard diagnostic test for arrhythmias. However, there is limited

understanding of nurses' knowledge and skills in recognising cardiac rhythms and care provided to these patients (Sheilini & Devi, 2014).

One of the cardinal critical care nursing skills is monitoring ECG. In potentially life-threatening circumstances, the nurse is expected to interpret the rhythm accurately and respond timely. To do this the nurse must be well trained, and have knowledge and skill in rhythm interpretation. Arrhythmias are important cause of preventable death in world. Majority of these arrhythmias occur secondary to coronary artery disease. Sudden death due to lethal arrhythmias can be the initial manifestation of coronary artery disease in many patients. Inadequate recognition and management of coronary artery disease and its symptoms lead to complications (Khalil et al, 2018).

Since nursing students is the future of nursing services across the globe, their training in ECG

*The authors are: 1. Vice Principal, Bhopal Nursing College, Bhopal Memorial Hospital and Research Centre, Bhopal, Madhya Pradesh. 2. MSc Nursing Student, Bhopal Memorial Hospital and Research Centre, Bhopal Madhya Pradesh. 3. Lecturer, Bhopal Nursing College, Bhopal Memorial Hospital and Research Centre, Bhopal, Madhya Pradesh. 4. Associate Professor, Nursing College, All India Institute of Medical Sciences, Bhopal, Madhya Pradesh.*

rhythm recognition and interpretation is pivotal for the quality of health care delivery. Many research studies across the globe have shown that staff nurses possess little or no knowledge about interpretation of the ECG rhythms; they are also unsure how structured teaching programme improves the knowledge and skill of ECG interpretation significantly (Swamy, 2017; Sasikala, 2019; Verma, 2019). Numerous other studies have shown effectiveness of training about ECG interpretation knowledge and skill on nursing students in India and abroad. Sheilini & Devi (2014) reported that there was no one with poor knowledge prior to intervention but some improvement was seen in the knowledge after intervention but there was significant improvement in the skill of interpreting ECG. Similarly, Ranjana (2018), Pareek & Kausik (2018), Sabu et al (2017), Swami (2017), Tahboub & Yilmaz (2019) and Tawalbeh & Tubaishat (2013) conducted experimental studies and reported that the nursing students had poor prior knowledge and skill of ECG interpretation which improved significantly after intervention.

As nurses are frontline care providers, they are the key persons involved in identifying dysrhythmia and taking appropriate interventions. Competency in identifying cardiac arrhythmia is very important to assess status of cardiac patients, assess response to treatment, and to monitor patients post-operatively Khalil et al (2018). However, the ability to educate nurses about ECG interpretation has been disrupted by the ongoing Covid-19 pandemic, first reported in Wuhan, China in December 2019. Because social distancing and isolation are the main precautions for avoiding further spread of the virus, in-person education in colleges and universities have been abandoned in favour of virtual classrooms. With regard to nursing education of ECG interpretation, robust studies are required to gauge the effectiveness of virtual training in the current Covid-19 pandemic.

Previous research has found that online training may prove to be effective to impart knowledge and skill of ECG interpretation. Neha K et al concluded that computer-assisted teaching is effective in increasing the knowledge regarding ECG interpretation among nursing students. Preliminary study of the PULSE Trial, has shown that nurses' ECG monitoring knowledge can improve after taking the online ECG course (Wu Hui, 2012). Habibzadeh et al (2019) and Montassier et al (2016) also reported that online or virtual training was as effective as traditional learning through traditional methods.

According to WHO, CVDs are the leading cause of death globally; more people die annually from CVDs than from any other causes. It was seen that 17.9 million people died from CVDs in 2016, rep-

resenting 31 percent of all global deaths. Among these deaths, 85 percent are due to heart attack and stroke. People who are at risk for cardiovascular disease or who are having cardiovascular problem need counselling regarding lifestyle modification, including physical activity as appropriate

## Objectives

The objectives of the study were to:

1. Assess the pretest and post-test level of knowledge on ECG interpretation among undergraduate nursing students,
2. Evaluate the effectiveness of virtual structured teaching programme on knowledge of ECG interpretation among undergraduate nursing students, and
3. Find the association between pre-test level of knowledge on ECG interpretation and selected demographic variables among undergraduate nursing students.

## Review of Literature

K Sasikala (2019) conducted a study on Effect of Structured Teaching Programme on Knowledge, Interpretation of Electrocardiogram among Critical care nurses at Selected Wards of Shree Ramakrishna Hospital, Coimbatore to improve knowledge regarding ECG interpretation. Experimental one group pre-test post-test design was used for 30 nurses of selected wards of Hospital. The mean pre-test level of knowledge was 6.43 with a standard deviation of 1.95. The post-level of knowledge was 9.46 with a standard deviation of 1.71. Calculated 't' value was 2.92 which was greater than a tabled value at 0.5 of significance. The study concluded that structured teaching programme was effective on knowledge and interpretation of electrocardiogram among critical care nurses at selected words of Shree Ramakrishna hospital, Coimbatore.

S Verma (2019) conducted a pre-experimental study to assess the effectiveness of planned teaching programme on knowledge of recording and interpretation of electrocardiogram among staff nurses working in selected intensive care units at Shimla, Himachal Pradesh. Total of 55 staff nurses were selected by purposive sampling technique. Self-structured knowledge questionnaire was used for the study. Study revealed mean percentage, in pre-test was 20.8 (47.27) with standard deviation of 8.1 and in post-test it was 33.6 (76.36) with standard deviation of 4.4 Result showed a significant improvement in knowledge after planned teaching programme on staff nurses.

Neha K, Bist M et al. (2019) conducted a study on knowledge of student nurses regarding Interpretation of Electrocardiogram: A Pre-experimen-

**Table 1: Socio-demographic characteristics of undergraduate Nursing students (n=100)**

Sociodemographic Variables		Frequency	Percentage
Age (in years)	19-21	84	84
	22-24	16	16
Gender	Male	00	-
	Female	100	100
Previous training in ECG	Yes	08	08
	No	92	92
Exposure to ECG room during clinical posting	Yes	61	61
	No	39	39

tal study, in Marinda College of nursing, Bangalore at finding the effectiveness of computer-assisted teaching of ECG and its interpretation among BSc Nursing students of third and fourth year students. Sample consists of 60 nursing students. One group pre-test post-test was selected to assess the effectiveness of computer simulated teaching and its interpretation. The pre-test mean knowledge score was 17.33 and post score was 30.88 with paired “t” test value of 31.89 which was significant at 0.05 levels.

### Material and Methods

It was a quantitative research with pre-experimental one group pre-test and post-test research design. The study setting was selected nursing colleges in Bhopal, Madhya Pradesh. One hundred BSc nursing students were selected through convenient sampling technique. Those students who can read and write English and were able to connect through virtual mode were included in the study. Pre-test and virtual training was carried out on day 1 followed by post-test on day 7.

Virtual training programme was carried out online with screen sharing of PPT and discussion through Google Meet. The created id has given to the participants before the training via created WhatsApp group. The training was aimed at educating student nurses regarding conduction system of heart, ECG leads, placement of electrocardiogram leads, analysis of normal electrocardiogram, determining heart rate from ECG and explaining selected dysrhythmias. Virtual training was given for one hour followed by one hour of discussion. Data was collected through 30 items structured knowledge questionnaire. Content of the tool and teaching programme were validated by 10 experts in the field of Nursing and Medicine. Test-retest

reliability coefficient of the tool was 0.95.

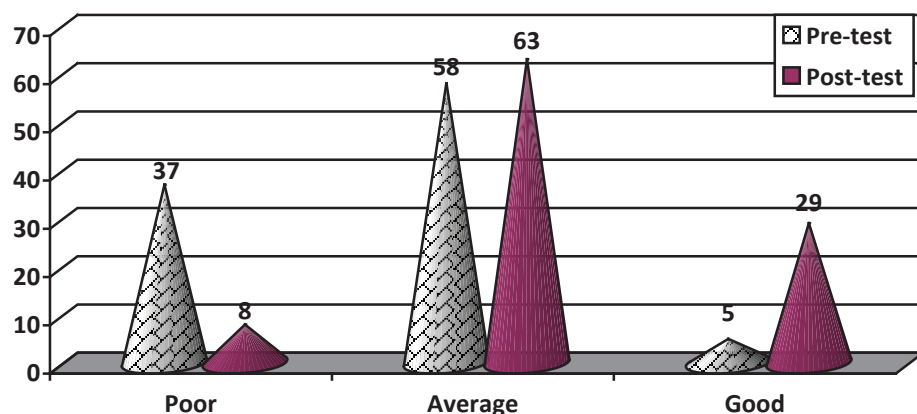
Each correct answer carried 1 mark and 0 was awarded for wrong answer and unattempted question. Knowledge score ranged from 0 to 30. Knowledge level was categorised as 0-10 poor; 11-20 average and 21-30 good. Ethical committee of Bhopal Memorial Hospital and Research Centre (Under Indian Council of Medical Research), Bhopal (Madhya Pradesh) approved the study protocols. Permission and approval for data collection was also taken from nursing colleges selected for data collection.

Informed consent was taken from study participants through Google form. The obtained data was analysed by using SPSS Software version 20.

### Results

Majority (84%) of nursing students belonged to age group 19-21 years (Table 1). All study subjects were female. Majority of nursing students (92%) did not have any previous training in ECG. Majority of students (61%) had exposure to ECG room during clinical posting.

The study showed that majority of students 84% belonged to age group 19-21 and rest of the students were of 22-24 years (16%) and none of them were between 25-27 years and >28 years of age. Percentage distribution of nursing students according to gender: all subjects were female, there was no male student nurse in the sample. Percentage distribution of students according to previous training in ECG showed that majority of sample (92%) did not have any training in ECG and few (8%) of them had undergone training in ECG. More than half of students (61%) had exposure to ECG room during clinical posting and (39%) students did not have any exposure to ECG room.



**Figure 1: Comparative frequency and percentage distribution of students according to the pre-test v/s post-test knowledge score category (n=100).**



**Table 2: Comparison of pre-test v/s post-test mean knowledge score of ECG interpretation among nursing students (n=100)**

Test	Knowledge score		‘t’ Statistics
	Mean	SD	
Pre-test	12.78	4.34	t=12.88 P=0.0001**
Post test	16.89	5.27	

**Table 3: Association of pre-test knowledge level with selected variables among nursing students (n=100)**

Selected Variables	Level of Knowledge			$\chi^2$ Statistics
	Poor (0-10)	Average (11-20)	Good (21-30)	
Age in Yrs.				
19-21 Yrs.	22	57	5	df=2 P=0.265 $\chi^2 = 2.65$
22-24 Yrs.	7	9	0	
Any Training in ECG Undergone				
Yes	4	4	0	df=2 P=0.617 $\chi^2 = 0.965$
No	33	53	6	
Previous Exposure to ECG room				
Yes	26	32	3	df=2 P=0.336 $\chi^2 = 2.18$
No	11	25	3	

More than half (58%) of the nursing students were in average knowledge score category followed by 37 percent in poor and 5 percent were in good knowledge score category in pre-test regarding ECG (Figure 1). In posttest majority of the students were in average knowledge score category (63%) followed by 29 percent in good knowledge score category and 8 percent were in poor knowledge score category.

The mean pre-test knowledge score was 12.78±4.34 whereas it increased significantly (p<0.05) in the post-test (16.89±5.27). It shows that the virtual training was effective in enhancing knowledge of nursing students. As illustrated in table 3 there was no significant association between pre-test knowledge level of ECG interpretation and selected variables among nursing students.

## Discussion

Competent nurses must possess necessary knowledge to interpret dangerous cardiac rhythms so that patient's life can be saved in coronary care or critical care units. The present study included B.Sc. Nursing students as study participants. Previous studies also reported similar sample char-

acteristics (Steilini & Devi 2014; Swamy, 2017; Verma, 2019; Ranjana, 2018; Pareek & Kausik, 2018; Sabu et al, 2017; Tawalbeh & Tubaishat, 2013; Habibzadeh et al 2019). The present study explored that virtual training amid Covid-19 pandemic was effective as post-test mean score was significantly higher as compared to pre-test score. Furthermore, none of sociodemographic characteristics was significantly associated with pretest knowledge score.

Neha et al (2019) concluded that computer-assisted teaching is effective in increasing the knowledge regarding ECG interpretation among nursing students. Habibzadeh et al (2019) also reported that both virtual and traditional teaching methods on interpretation of cardiac dysrhythmias in nursing students were equally effective. The result shows that both educational methods were preferred methods to educate students. Covid-19 pandemic in India has forced the educational system to shift on online teaching learning mode that seems to become a norm in future. The present study explored that training in ECG interpretation can be carried out through virtual platforms where group of students can be trained in sophisticated skill of analysis of ECG rhythms to diagnose dangerous cardiac dysrhythmias.

## Nursing Implications

- Nursing administrators can plan virtual staff development programme for nursing officers to improve knowledge on ECG interpretation.
- Nursing faculty can plan online seminar on ECG interpretation for nursing students.

## Recommendations

- A similar study can be carried out on larger sample for nursing students and nursing officers.
- A comparative study can be done between two teaching method; virtual platforms and traditional method.

## Limitations

- Selected study sample doesn't have any male nursing students which may impact study results and limit the generalisability of the study findings.
- It was a preexperimental one group pre-test post-test study without control group. Therefore, there is possibility of pretesting effect and contamination of study result by uncontrolled extraneous variables.

## Conclusion

The present study explored that virtual training may serve as an effective alternative medium of in-

struction to impart knowledge and skill regarding ECG interpretation among undergraduate nursing students amid Covid-19 pandemic across the globe. Virtual training programme was effective to enhance the knowledge of nursing students about electrocardiogram.

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