International Journal of Community Medicine and Public Health
Rukhsar A et al. Int J Community Med Public Health. 2026 Mar;13(3):1202-1208
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040
DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20260670

Original Research Article

A pre-experimental study to assess the effectiveness of planned teaching programme on knowledge regarding electrocardiogram and its interpretations among nursing students in selected nursing institutions, Jalandhar, Punjab

Akida Rukhsar[1], Veena Williams[1], Jophy E. George[2]*

[1]Department of Medical Surgical Nursing, MHR DAV Institute of Nursing, Jalandhar, Punjab, India
[2]Department of Child Health Nursing, MHR DAV Institute of Nursing Jalandhar, Punjab, India

Received: 31 August 2025
Revised: 04 February 2026
Accepted: 05 February 2026

***Correspondence:**
Dr. Jophy E. George,
E-mail: jophygeorge5@gmail.com

ABSTRACT

Background: An electrocardiogram (ECG) is a visual representation that offers precise information about an individual's heart rate, rhythm, and any associated abnormalities. It may indicate if the heart has enlarged as a result of hypertension (high blood pressure) or whether there is evidence of a past myocardial infarction (heart attack). Performing non-invasive testing is simple, and the results are immediate basic knowledge of the electrocardiogram is usually the most difficult to assimilate, as it implies learning the basis of interpretation.
Methods: A pre-experimental study with a one-group pre-test and post-test design was conducted. A non-probability purposive sampling technique was used to select a sample of 100 nursing students who participated in the study. Data was collected using a self-structured knowledge questionnaire and analysed using both descriptive and inferential statistics.
Results: The mean pre-test score was 20.73±3.14 and post-test knowledge score was 35.28±2.19 With regards to electrocardiogram and its interpretations with a difference of 14.55. According to the result of our analysis, the computed 't' value (47.39) was statistically significant (p=0.001).
Conclusions: Researcher found that 'nursing students' post-test understanding of electrocardiogram and its interpretations improved following the introduction of planned teaching programme.

Keywords: Electrocardiogram, Knowledge, Planned teaching programme

INTRODUCTION

The cardiovascular system is a complex organ system that includes the heart and blood arteries. Circulation of blood occurs via a complex network of blood arteries that connect the heart to other tissues in the body. The blood arteries are separated into two circuits: the pulmonary circuit, which delivers blood to and from the lungs for gas exchange, and the systemic circuit, which carries blood to and from the rest of the body. Every circuit starts and concludes with the heart. The cardiovascular system is comprised of blood arteries and the heart.[1]

According to the 2023 report by the World Heart Federation, more than 500 million individuals across the globe continue to suffer from cardiovascular diseases.[2] These conditions were responsible for 20.5 million deaths in 2021, making up nearly one- third of all global fatalities. This figure marks an increase from the previously estimated 121 million deaths attributed to cardiovascular diseases. Cardiovascular conditions

present a significant public health challenge, particularly in low- and middle-income countries, where approximately three-quarters of all global deaths from cardiovascular diseases occur. People living in these regions often lack access to basic healthcare programs designed to identify and manage individuals at risk for cardiovascular diseases.[3,4]

A planned teaching program on electrocardiogram (ECG) interpretation is a structured and comprehensive educational initiative designed to strengthen both the theoretical foundation and practical competencies of students and healthcare professionals in analysing the heart's electrical activity.[5] The curriculum typically begins with essential topics, including cardiac anatomy, physiology, and the function of the cardiac conduction system. It explains the origin and significance of ECG waveforms such as the P wave, QRS complex, T wave, and U wave and introduces the standard 12-lead ECG system, emphasizing correct electrode placement and strategies to minimize artefacts during recording.[6] A key component of the program is the systematic approach to ECG interpretation. This includes assessment of heart rate, rhythm, electrical axis, and critical intervals like PR, QRS, and QT. The training also focuses on identifying a range of cardiac conditions, including arrhythmias, myocardial infarction, ischemia, and various conduction abnormalities, equipping learners with the skills needed for accurate clinical decision-making.[7]

Electrocardiography is the most widely utilized diagnostic tool in cardiology. When interpreted accurately, it plays a vital role in diagnosing and managing cardiac disorders, particularly cardiac arrhythmias and acute myocardial ischemic syndrome two leading causes of cardiac emergencies.[8] ECGs are also effectively employed as a screening tool in various clinical contexts. However, mastering ECG interpretation requires understanding its foundational principles, which many find challenging. With the rise in patient acuity and the increasing demands on critical care services, ward-based care now often involves managing more seriously ill patients. Consequently, nurses must enhance their expertise in cardiac care.[9] Proficiency in rhythm monitoring is essential for identifying cardiac changes, evaluating treatment responses, supporting diagnoses, and overseeing post-surgical recovery.[10,11] For nursing students, practicing nurses, and resident doctors alike, correlating clinical findings with ECG data is a fundamental skill. Effective ECG interpretation depends on integrating clinical judgment with core knowledge of electrocardiographic patterns.[12]

India faces an alarming rise in cardiovascular-related mortality. The Journal of the American College of Cardiology projected 4.77 million CVD deaths in India by 2020, while sudden cardiac arrest accounts for 5-10 lakh annual deaths, contributing to approximately 10% of total deaths.[13] A 2023 Hindustan Times report highlighted an increase in sudden deaths among young adults, often without prior symptoms, underscoring the silent nature of cardiac issues.[14] In Punjab, the Times of India (2020) reported that CVD-related deaths surpassed COVID-19 fatalities.[15] Of the 229,846 total deaths, 36.2% were due to circulatory diseases, with most fatalities occurring in individuals over 55 years of age. These statistics reflect an urgent need for early recognition and timely intervention at all healthcare levels.[16]

To address this educational gap, planned teaching program (PTPs) provide a structured approach to learning electrocardiogram interpretation. These programmers combine theoretical content, visual aids, and practical exercises to reinforce understanding. A planned teaching programme (PTP) provides structured education combining theory, visual aids, and hands-on practice to improve ECG interpretation. It covers cardiac anatomy, conduction pathways, waveform analysis, lead placement, and recognition of critical patterns This study evaluated the effectiveness of a PTP in enhancing ECG interpretation among nursing students in Jalandhar, Punjab, aiming to boost clinical competence and patient safety

Objectives

To assess the pre-test knowledge score regarding electrocardiogram and its Interpretations among nursing students. To plan and implement a planned teaching programme regarding electrocardiogram and its interpretations among nursing students. To assess the post-test knowledge score regarding electrocardiogram and its interpretations among nursing students. To compare pre-test and post-test knowledge score regarding electrocardiogram and interpretations among nursing students. To find out the association of pre-test knowledge score regarding electrocardiogram and its interpretations among nursing students with their selected socio-demographic variables.

METHODS

The study followed a quantitative research approach using a pre-experimental one-group pre-test–post-test design to assess the effectiveness of a planned teaching programme on electrocardiogram (ECG) and its interpretation among nursing students in selected institutes of Jalandhar, Punjab. The study was conducted at MHR DAV Institute of Nursing and LLR Institute of Nursing with a sample of 100 B.Sc. (N) 3rd-semester students selected through non-probability purposive sampling. Inclusion criteria included students willing to participate and available during data collection. The independent variable was the planned teaching programme on ECG, and the dependent variable was knowledge regarding ECG and its interpretation. A self-structured questionnaire with 40 multiple-choice items and a planned teaching programme were developed after a literature review and validated by experts; reliability was established using the split-half method and Spearman

Brown's formula. Socio-demographic details and knowledge assessment were collected via two sections of the tool. A pilot study with 10 students confirmed feasibility. Ethical clearance and permissions were obtained, and informed consent was taken from participants. Data collection involved a pre-test, implementation of the planned teaching programme, and a post-test on the third day. Data were analysed using descriptive statistics (frequency, percentage, mean, SD) and inferential statistics (paired t-test to compare pre- and post-test scores and Chi-square to assess associations with demographic variables).

The data was collected in the month of May after getting administrative approval from 16-05-2025 to 22-05-2025. Written permission was taken from the higher authority i.e. principal of selected nursing institutes, Jalandhar, Punjab. Purpose of the study was explained to the samples and was explained to samples and was assured about anonymity and confidentiality of information provided by them and informed consent was taken from participate in the study, then 100 nursing students of selected nursing institutes were selected by using non-probability purposive sampling technique. A structured knowledge questionnaire was used to evaluate the knowledge regarding electrocardiogram and its interpretations among nursing students.

RESULTS

Table 1 shows that most nursing students, 56% (56), were aged 20-22 years, 38% (38) were 23-25 years, and 6% (6) were above 25 years. Females formed the majority at 81% (81), while males were 19% (19). Regarding family type, 35% (35) belonged to nuclear, 33% (33) to extended, and 32% (32) to joint families.

Table 1: Frequency and percentage distribution of nursing students according to socio-demographic variables.

Socio demographic variables	Frequency (n=100)	Percentage
Age (in years)		
20-22 years	56	56.00
23-25 years	38	38.00
More than 25 years	06	6.00
Gender		
Male	19	19.00
Female	81	81.00
Type of family		
Nuclear	35	35.00
Joint	32	32.00
Extended	33	33.00
Fathers occupation		
Medical	15	15.00
Paramedical	13	13.00
Others	31	31.00
Unemployed	41	41.00
Mothers occupation		
Medical	7	7.00
Paramedical	10	10.00
Others	26	26.00
Unemployed	57	57.00
Previous information regarding electrocardiogram and its interpretation		
Yes	100	100.00
No	0	0
If yes, source of information regarding electrocardiography and its interpretation		
Mass media (books, journals, TV, internet)	10	10.0
Peer groups	06	6.00
Health professionals	21	21.00
Classroom teachings	53	53.00
Clinical experience	10	10.00
Have you ever seen any person having cardiac related symptoms during your clinical posting?		
Yes	75	75.00
No	25	25.00

Fathers' occupations included unemployed (41%), others (31%), medical (15%), and paramedical (13%), while mothers were mostly unemployed (57%), followed by others (26%), paramedical (10%), and medical (7%). All students (100%) had prior ECG knowledge, mainly from classroom teaching (53%), health professionals (21%), mass media (10%), clinical experience (10%), and peers (6%). Practical exposure showed 75% encountered cardiac symptoms during clinical postings, whereas 25% did not.

Table 2: Mean and mean percentage of pre-test knowledge score regarding ECG interpretation among nursing students (n=100).

Knowledge score	Range	Mean	SD	Mean percentage
Pre-test	12-25	20.73	±3.14	51.82

Maximum score: 40; Minimum score: 00.

Table 3: Frequency and percentage distribution of pre-test level of knowledge regarding electrocardiogram and its interpretations among nursing students.

Level of knowledge	Score	Frequency	Percentage
Good	30-40	00	00.00
Average	20-29	67	67.00
Below average	0-19	33	33.00

Maximum score: 40; Minimum score: 00.

Table 4: Area-wise mean and mean percentage of pre-test knowledge score regarding ECG interpretation among nursing students (n=100).

Areas of knowledge in questionnaire	No. of items	Pre-test mean	Mean percentage
Introduction of ECG	10	5.37	53.7
Normal and abnormal interpretation of ECG	20	10.51	52.55
Nursing responsibility during ECG procedure	10	4.85	48.50

Maximum score: 40; Minimum score: 00.

Table 5: Mean and mean percentage of post-test knowledge score regarding ECG interpretation among nursing students.

Knowledge score	Range	Mean	SD	Mean percentage
Post-test	30-39	35.28	±2.19	88.5

Maximum score: 40; Minimum score: 00.

Table 6: Frequency and percentage distribution of post-test level of knowledge regarding ECG interpretation among nursing students.

Level of knowledge	Score range	Frequency	Percentage
Good	30-40	100	100.00
Average	20-29	00	0.00
Below average	0-19	00	0.00

Maximum score: 40; Minimum score: 00.

Table 7: Comparison of mean pre-test, and mean post-test knowledge scores regarding ECG interpretations among nursing students.

Test type	Mean Score	SD	Mean difference	df	t-value
Pre-test	20.73	±3.14	14.55	99	47.39 ***
Post-test	35.28	±2.19			

Maximum score: 40; Minimum score: 00. *** = very highly significant at p<0.001.

Table 2 indicates that the pre-test knowledge scores regarding electrocardiogram and its interpretation among nursing students ranged from 12 to 25, indicating varied levels of baseline understanding. The mean score was 20.73, with a standard deviation of ±3.14, suggesting moderate dispersion of scores around the average. The mean percentage score was 51.82%, which reflects a low level of knowledge among the majority of students before any intervention or educational input. The finding highlights the need for structured and targeted educational programs to improve foundational knowledge on electrocardiogram and its interpretations among nursing students.

Table 3 depicts, a majority of nursing students (33%, n=33) demonstrated a below average level of knowledge (score range: 0-19) regarding electrocardiogram and its interpretations in the pre-test. Only 67% of the students achieved an average level of knowledge (score range: 20-29), while none scored in the good category (score range: 30-40). The distribution clearly indicates a significant gap in basic ECG interpretation knowledge, reinforcing the necessity cl for focused educational interventions to enhance student competence in the critical

Table 4 depicts that area wise mean and means percentage of pre-test knowledge score regarding electrocardiogram and its interpretations among nursing students. It indicates that the mean pre-test knowledge score regarding introduction of electrocardiogram was 5.37 (5.37%) and normal and abnormal interpretation of electrocardiogram was 10.51 (52%) and nursing responsibility was 4.85 (48.50).

Table 5 depicts that mean post-test knowledge score regarding electrocardiogram and its interpretation among nursing students was 35.28±2.19 with mean percentage of 88.5% hence, it revealed that in post-test nursing students were having good knowledge regarding electrocardiogram and its interpretations.

Table 6 depicts that in post-test 100 (100%) were having good knowledge regarding electrocardiogram and its interpretation no one is having average knowledge regarding electrocardiogram and its interpretation and no one is having below average knowledge regarding electrocardiogram and its interpretations.

Table 7 depicts that the mean pre-test knowledge score regarding electrocardiogram and its interpretations was 20.73±3.14 and mean post–test knowledge score regarding electrocardiogram and its interpretations was 35.28±2.19. The mean difference between pre-test score and mean post-test score before and after planned teaching programme was 14.55. the calculated ‘t’ value was 47.39 which was found to be statistically highly significant at $p<0.001$ level of significance.

Hence it revealed that the difference in the mean post-test knowledge score regarding electrocardiogram and its interpretation among nursing students was true difference and not by chance. Thus, research hypothesis (H1) was accepted.

DISCUSSION

The findings of present study showed that the mean post-test knowledge score was 20.73±3.14 with mean percentage 51.82%, which reflects a low level of knowledge among the majority of students before any intervention or educational input. The finding highlights the need for structured and targeted educational programs to improve foundational knowledge on electrocardiogram and its interpretations among nursing students. The findings also consistent with the study showed that the mean pre-test knowledge score was 13.42±3.10 with a mean percentage of 44.7%, reflecting a low level of understanding of electrocardiogram interpretation among nursing students. who found that the majority of participants had inadequate knowledge before receiving any structured educational input, thereby highlighting the need for planned teaching programmes to strengthen core competencies

The findings of present study showed that the mean post-test knowledge score was 35.28±2.19 with mean percentage 88.20%. As per level of knowledge 100 (100%) nursing students were having good knowledge regarding electrocardiogram and its interpretations. These finding are closely aligned with study conducted by reported a mean post-test knowledge of score 30.88. According to their results 80% of participants demonstrated good knowledge 10% had average knowledge regarding electrocardiogram and its interpretation.

The findings of present study showed that after implementation of planned teaching programme there was significant increase in post-test knowledge regarding electrocardiogram and its interpretations as the paired ‘t’ value was 47.39 which was found to be statistically significant at $p<0.001$ that represents the efficacy of planned teaching programme. The findings are also consistent with a study conducted, which reported a paired t-value of 48.12 and a p value of less than 0.001, indicating that the planned teaching programme led to statistically significant improvements in knowledge

Finally, the mean difference between pre-test score and mean post-test score before and after planned teaching programme was 14.55. the calculated ‘t’ value was 47.39 which was found to be statistically highly significant at $p<0.001$ level of significance.

Hence it revealed that the difference in the mean post-test knowledge score regarding electrocardiogram and its interpretation among nursing students was true difference and not by chance. Thus, research hypothesis (H1) was accepted.

The limitation of the present study was limited to only nursing students, so the broad generalization of the study finding was not possible. A pre-experimental one group was used without control which limits the ability to establish cause- and effect relationship.

CONCLUSION

The findings of the study concluded that there was a significant improvement in the post-test knowledge scores regarding electrocardiogram and its interpretation among nursing students, as measured by a self-structured knowledge questionnaire. This indicates that the planned teaching programme was effective in enhancing their knowledge. This study contributes to existing nursing education literature by highlighting the importance of early, focused ECG training to strengthen students theoretical understanding, which is essential for timely recognition of cardiac abnormalities in clinical practice. the result emphasized the need to integrate structured ECG teaching modules into nursing curricula.

ACKNOWLEDGEMENTS

My heartfelt gratitude to my supervisor, Dr. Mrs. Veena Williams, and co-supervisor, Mrs. Jophy Elezabeth George, for their invaluable guidance and support. Special thanks to Mrs. Kulwinder Kaur for her practical assistance, the ethical committee, subject experts, and Mr. C.S. Aggarwal for statistical help. I am grateful to the principals of participating institutions, all study participants, scholars whose work aided my research.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Marieb EN, Hoehn K. Human Anatomy and Physiology. 10th edn. Pearson Education, Inc; 2019.
2. World Health Organization. (2021). Cardiovascular diseases (CVDs). Available from: https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds). Accessed on 5 November 2025.
3. American Heart Association. About Heart Attacks. 2023. Available from: https://www.heart.org/en/health-topics/heart-attack/about-heart-attacks. Accessed on 5 November 2025.
4. Chong B, Jayabaskaran J, Jauhari SM, Chan SP, Goh R, Kueh MT, et al. Global burden of cardiovascular diseases: projections from 2025 to 2050. Eur J Prevent Cardiol. 2025;32(11):1001-15.
5. Kligfield P, Gettes LS, Bailey JJ, Childers R, Deal BJ, Hancock EW, et al. Recommendations for the standardization and interpretation of the electrocardiogram: part I: the electrocardiogram and its technology a scientific statement from the American Heart Association Electrocardiography and Arrhythmias Committee, Council on Clinical Cardiology; the American College of Cardiology Foundation; and the Heart Rhythm Society endorsed by the International Society for Computerized Electrocardiology. J Am Coll Cardiol. 2007;49(10):1109-27.
6. Surawicz B, Knilans TK. Chou's Electrocardiography in Clinical Practice: Adult and Pediatric. 6th edn. Elsevier; 2008.
7. Mayo Clinic. Electrocardiogram (ECG or EKG). 2023. Available from: https://www.mayoclinic.org/tests-procedures/ekg/about/pac-20384983. Accessed on 5 November 2025.
8. Cajavilca C, Varon J. Willem Einthoven: The Development of the Human Electrocardiogram. Resuscitation. 2008;76(3):325-8.
9. National Heart, Lung, and Blood Institute (NHLBI). Electrocardiogram. 2022. Available from: https://www.nhlbi.nih.gov/health/electrocardiogram. Accessed on 5 November 2025.
10. Fye WB. A history of the origin, evolution, and impact of electrocardiography. Am J Cardiol. 1994;73(13):937-49.
11. Pelliccia A, Sharma S, Gati S, Bäck M, Börjesson M, Caselli S, et al. 2020 ESC Guidelines on sports cardiology and exercise in patients with cardiovascular disease: The Task Force on sports cardiology and exercise in patients with cardiovascular disease of the European Society of Cardiology (ESC). Eur Heart J. 2021;42(1):17-96.
12. Drew BJ, Califf RM, Funk M, Kaufman ES, Krucoff MW, Laks MM, et al. AHA scientific statement: practice standards for electrocardiographic monitoring in hospital settings: an American Heart Association Scientific Statement from the Councils on Cardiovascular Nursing, Clinical Cardiology, and cardiovascular disease in the young: endorsed by the International Society of Computerized electrocardiology and the American Association of Critical-Care Nurses. J Cardiovasc Nurs. 2005;20(2):76-106.
13. Jablonover RS, Stagnaro-Green A. ECG as an Entrustable Professional Activity: CDIM Survey of Medical Student Ability to Interpret Electrocardiograms. Med Educ Online. 2016;21(1):30020.
14. Bharman B, Mahanta J. Effectiveness of structured teaching programme on knowledge regarding electrocardiogram (ECG) interpretation among B.Sc. nursing students. Int J Nurs Educ Res. 2024;12(2):45-50.
15. Global Burden of Cardiovascular Diseases and Risks Collaboration. Global Burden of Cardiovascular Diseases and Risks, 1990-2022. J Am Coll Cardiol. 2023;82(25):2350-473.
16. Global Burden of Cardiovascular Diseases and Risks Collaboration. Global Burden of Cardiovascular Diseases and Risks, 1990-2022. J Am Coll Cardiol. 2023;82(25):2350-473.

17. Bdair IA. The effect of a training program on nursing students' knowledge and competency in electrocardiogram interpretation: A quasi-experimental study. BMC Nurs. 2023;22:131.
18. Salem OA, Suliman WA. Electrocardiogram interpretation competency among nurses: a review of the literature. Int J Afr Nurs Sci. 2019;10:140-5.
19. Doku A, Tuglo LS, Boima V, Agorinya IA, Li X, Zhou J, et al. Prevalence of cardiovascular diseases and associated risk factors in Ghana: a systematic review and meta-analysis. BMJ Open. 2023;13(5):e068328.
20. Monika N, Ali A, Yasmine N, Gupta A, Nongkynrih B, Goswami K. Assessment and prediction of cardiovascular risk and associated factors among tribal population of Assam and Mizoram, Northeast India: a cross-sectional study. Front Public Health. 2022;10:981970.
21. Hinton W, McGovern A, Coyle R, Han TS, Sharma P, Correa A, et al. Incidence and prevalence of cardiovascular disease in English primary care: a cross-sectional and follow-up study of the Royal College of General Practitioners (RCGP) Research and Surveillance Centre (RSC). BMJ Open. 2018;8(8):e020282.

Cite this article as: Rukhsar A, Williams V, George JE. A pre-experimental study to assess the effectiveness of planned teaching programme on knowledge regarding electrocardiogram and its interpretations among nursing students in selected nursing institutions, Jalandhar, Punjab. Int J Community Med Public Health 2026;13:1202-8.