STM JOURNALS

Effectiveness of Structured Teaching Programme on Knowledge Regarding ECG and Its Basic Interpretations Among Second Semester BSc Nursing Students in Selected Nursing College at Pathanamthitta District

Aksa Maria Saji[1], Anaswara Pradeep[1]. Ann Maria Kurian[1], Juliya Jose[1], Muhammed Hashim N.[1], Riya Baiju[1], Sruthi B.[1], Tesu James[1], Sony Aleyamma D.[2],*

Abstract

Cardiovascular diseases have now become the leading cause of mortality in India. Cardiovascular disease accounts for twenty five percent of all mortality. Electrocardiogram has an important role in the early detection and treatment of various cardiovascular diseases. Over the year significant advancements have been made in the field of ECG research, leading to the development of new techniques, technologies and algorithms for ECG analysis. ECG allows nurse to diagnose and monitor various cardiac conditions including arrhythmia, myocardial damage and provides quick management to the condition. If the nurse has to respond to this condition, it is essential to know about ECG and its basic interpretations. Efficacy in interpreting normal and pathological ECG is vital to determine any cardiac abnormalities and initiate the appropriate care required. Theoretical knowledge and practical skill on the recognition of pathological ECG trace improve the skill of ECG evaluation among nursing students. Accurate ECG interpretation by nurses leads to rapid recognition and treatment of cardiac emergencies and thereby reducing morbidity and mortality related to cardiovascular diseases. The current study aimed to assess the pre-test level of knowledge regarding ECG and its basic interpretations among second semester BSc Nursing students, assess the effectiveness of structured teaching programme on knowledge regarding ECG and its basic interpretations and to find the association between the existing level of knowledge regarding ECG and its basic interpretations with selected sociodemographic variables. The chosen research design for this study is a pre-experimental design featuring a single-group pre-test post-test structure. The study was conducted in Holy cross college of Nursing, Adoor, Pathanamthitta. By using purposive sampling technique 30 second semester BSc Nursing students, who have met the inclusion criteria, were selected as samples. After identifying the knowledge regarding ECG and its basic interpretations by structured knowledge questionnaire Students were given structured teaching programme on ECG and its basic interpretations. The follow-up assessment was carried out utilizing the identical instrument. Majority of the study subjects were unaware of ECG and its basic interpretations. The administration of structured teaching programme helped to improve level of knowledge among second semester BSc Nursing students regarding ECG and its basic interpretations. The study results revealed that p value was significant for only gender among socio demographic variables.

Keywords: ECG, structured teaching programme, questionnaire, knowledge nursing

Author for Correspondence
Sony Aleyamma D.
E-mail: sonynimesh82@gmail.com

[1]Nursing Students, Department of Child Health Nursing, Holy Cross College of Nursing, Adoor, Kerala, India
[2]Associate Professor, HOD, Department of Child Health Nursing, Holy Cross College of Nursing, Adoor, Kerala, India

INTRODUCTION

In India cardiovascular diseases have now become the leading cause of mortality. One fourth of all mortality is attributed to cardiovascular disease. More than 10.5 million deaths occur annually in India. It was reported that cardiovascular diseases led to 20.3% of these deaths [1]. ECG plays an important role in the early detection and treatment of various cardiovascular diseases. Over the year significant advancements have been made in the field of ECG research, leading to the development of new techniques, technologies and algorithms for ECG analysis. This has allowed for improved accuracy and reliability in the interpretation of ECG recordings, ultimately leading to a deeper understanding of the mechanism underlying cardiac disease and arrhythmias [2]. In a recent investigation examining the frequency of ECG abnormalities and their association with patient characteristics in an asymptomatic population, it was discovered that males between the ages of 42 and 60 exhibited an elevated risk of sudden cardiac death when presenting asymptomatic ST segment depression. The results indicate a prevalent occurrence of unnoticed cardiac abnormalities in middle-aged individuals, both men and women, who display no apparent symptoms."

[3] The expected ECG interpretation competencies must be defined for all healthcare professionals to help solve the problem of declining literacy in ECG interpretation,. The efficiency of health care workers to record and interpret ECG for the detection of pathological disorders can help prevent cardiovascular disorders and reduce mortalities [1].

Significance of the Study

A study was conducted by Shyni. P. George and Caroline Joseph to assess the effectiveness of planned teaching programme about ECG and its basic interpretation on knowledge and practice among staff nurses using 50 convenient samples in a selected hospital, Ambikapur, Chattisgarh. The results showed that in pre-test 4% of the subject had excellent knowledge, 34% had good knowledge, 58% had average knowledge and 4% had below average knowledge whereas in post-test 78% had excellent knowledge, 20% had good knowledge, 2% had average knowledge and no one had below average knowledge [4]. Similarly a study conducted by Sasikala. A, Latha Venkatesan and Sasikala. D to evaluate the knowledge and practice on ECG skills among emergency nurses at selected hospital, Chennai, using purposive sampling technique with a sample size 30 showed that pre-test knowledge of more than half of the nurses are moderately adequate (53.3%) and 46.6% of nurses had inadequate knowledge. After post-test the successful knowledge about electrocardiogram is 74.5% and adequate knowledge was about 24.5% [5]. As these studies show a considerable increase in the post-test knowledge it is evident that providing a structured teaching programme on ECG and its basic interpretations is effective. The components of ECG interpretation competency are familiarity with ECG interpretation, being skilled in lead placement, continuous monitoring, and having a proper attitude toward ECG interpretation. People who possess competency in ECG interpretation are those who have sufficient knowledge about the pathophysiological mechanisms of common and rare ECG abnormalities [6]. Today's student nurses are tomorrow's registered nurses. Increased clinical competency and knowledge regarding advanced technologies help them to provide comprehensive and quality care and to improve their own standard as a professional. Conducting a structured teaching programme on second semester "Bachelor of Science in Nursing students enhance their theoretical understanding and practical proficiency in recognizing pathological electrocardiograms (ECG). It ultimately helps in decreasing the morbidity and mortality related to cardiovascular diseases through early detection and immediate management in their future professional life.

Operational Definition
Assess

It refers to the organized, and systematic process of collecting and analyzing the data related to knowledge regarding ECG and its basic interpretations among second semester BSc Nursing students.

Effectiveness

It refers to extent to which structured teaching has achieved the desired out come in terms of gaining the knowledge regarding ECG and its basic interpretations among second semester BSc Nursing students.

Structured Teaching Programme

It refers to systematically developed teaching material to provide information on different aspects of ECG and its basic interpretation among second semester BSc Nursing students.

Knowledge

It refers to sum of what is known regarding ECG and its basic interpretations among second semester BSc Nursing students.

Electrocardiography (ECG)

It is a medical test that measures and record electrical activity of the heart.

Interpretation

In this study, it is a way in which ECG is understood and explained.

Aim of the Study

Assess the existing level of knowledge regarding ECG and its basic interpretations among second semester BSc Nursing students.

"Assess the efficacy of a structured teaching program on ECG and fundamental interpretations among BSc Nursing students in their second semester. Find out the association between existing level of knowledge regarding ECG and its basic interpretations among second semester BSc Nursing students with selected socio demographic variables.

Research Hypothesis

H0: There is no significant difference between pre-test and post-test-level of knowledge score regarding ECG and its basic interpretations among second semester BSc Nursing students.

H1: A notable disparity exists in the knowledge scores between the pre-test and post-test phases regarding ECG and its basic interpretations among second semester BSc Nursing students

METHODOLOGY
Research Design

In this investigation, the researchers have employed a pre-experimental design featuring a single-group pretest-posttest structure.

Setting

The present study was conducted in Holy Cross College of Nursing at Adoor. Pathanamthitta.

Variables

Dependent variable: In this study the dependent variable is the knowledge of second semester Bsc Nursing students regarding ECG and its basic interpretations.

Independent Variable: In this study structured teaching programme on ECG and its basic interpretations is the independent variable.

Demographic Variables: Demographic variables include the baseline information about second semester BSc Nursing students such as gender, stream of education in plus two, education of father, education of mother, occupation of father, occupation of mother and previous knowledge regarding ECG.

Sample and Sample Size

In this study sample selected was second semester BSc Nursing students in Holy Cross College of Nursing at Adoor who fulfill the inclusion and exclusion criteria. Purposive sample of 30 students participated in the study.

Inclusion Criteria
- The second semester BSc Nursing students in Holy Cross College of Nursing, Adoor.
- Students who have given consent and attend all the sessions.
- Students who understand English.

Exclusion Criteria
- Students who are not willing to participate in this study.
- Students who are unavailable during the data collection period." The second semester BSc Nursing students who had undergone previous training on ECG and its basic interpretations.

Data Collection Tool
The tool used by researchers was structured knowledge questionnaire.

Section A: Demographic Proforma
Demographic proforma comprises of gender, area of residence, education of father, education of mother, occupation of father, occupation of mother, stream of education upto plus two, annual income of family and previous knowledge regarding ECG.

Section B: Structured Knowledge Questionnaire Regarding Health Hazards of Mobile Phone Usage
A structured knowledge questionnaire comprising of 35 questions was used to assess the knowledge. Each question has four answer choices in which one is right. Each correct answer carries score one and every incorrect and unanswered response is given score zero. The maximum score is 35. The score was then converted to percentage as seen in Table 1.

Score Ranking
Based on the score obtained after questionnaire administration knowledge level is classified as very poor (<20%), poor (21–40%), average (41–60%), good (61–80%) and very good (81–100%).

Table 1. Distribution of score and ranking.

Score	Percentage	Ranking
1–7	<20%	Very Poor
8–14	21–40%	Poor
15–21	41–60%	Average
22–28	61–80%	Good
29–35	81–100%	Very Good

Validity and Reliability
The tool reviewed by 5 experts in pediatric nursing and medical surgical nursing to test the content validity of tool. The necessary modifications was made according to the corrections given by the experts on related topic.

Pilot Study
After obtaining permission from the concerned authority, a pilot study was conducted among 4 second semester BSc Nursing students from the college who met the inclusion criteria. After data collection and analysis study design was found to be feasible by the investigator.

Data Collection Procedure
An official written permission was obtained from the principal of Holy Cross College of Nursing, Adoor.30 students who fulfill the inclusion and exclusion criteria were selected by using purposive sampling technique. The subjects were provided with an explanation of the study's purpose and nature,

and their consent was obtained-test was conducted by using structured knowledge questionnaire to assess existing knowledge regarding ECG and its basic interpretations. Then structured teaching programme which includes systematically developed teaching session aided with PowerPoint and video demonstration was given for duration of 45 minutes. The Structured teaching programme was followed by post-test with the same knowledge questionnaire after 3 days. Participants demonstrated interest in attending the teaching programme. Data collected were tabulated and analyzed by using descriptive and inferential statistical method.

Ethical Considerations

Written consent obtained from the second semester BSc Nursing students after complete description of the purpose and nature of the study. They were told that participation in the research study is voluntary. The researchers informed students about their rights to withdraw from the study at any time without giving any reason and without any effect on them and confidentiality assured to each one of them.

Statistical Analysis

The analysis was conducted using Statistical Package for the Social Sciences (SPSS), version 20. The collected data tabulated, summarised, computerised and analysed using appropriate descriptive and inferential statistical tests Demographic data was computed with the help of descriptive statistics. Analysis of the knowledge score is done with the help of frequency, percentage, mean, standard deviations and paired t test. The relationship between pre-test knowledge scores and demographic variables was calculated using chi-square statistics. Level of significance at $p < 0.05$ was used as the cut off value for statistical significance.

RESULT

The collected information were organized and presented under four sections:
- *Section 1:* Distribution of frequency and percentage of demographic variables.
- *Section 2:* Frequency and percentage distribution of level of knowledge regarding ECG and its basic interpretations among second semester BSc Nursing students
- *Section 3:* The efficacy of a structured teaching program on understanding ECG and its fundamental interpretations among second semester BSc Nursing students
- *Section 4:* Association between existing level of knowledge regarding ECG and its basic interpretations with selected socio demographic variables.

Section 1

Demographic Variables

Table 2 shows that, all the 30 students (100%) were female.

Figure 1 shows that, among 30 second semester BSc Nursing students, 7 (23.3%) belong to urban population, 22 (73.4%) belong to rural population and only 1 (3.3%) belong to other area of residence.

Figure 2 shows that, 14 (46.7%) of the fathers of second semester students studied upto SSLC, 7 (23.3%) studied upto Pre-degree, 7 (23.3%) are Graduates and only 2 (6.7%) attained higher education.

Table 2. Distribution of frequency and percentage of sample based on gender (n=30).

| Variable	Characteristics	Frequency (f)	Percentage (%)
Gender	Male	0	0
	Female	30	100
	Other	0	0
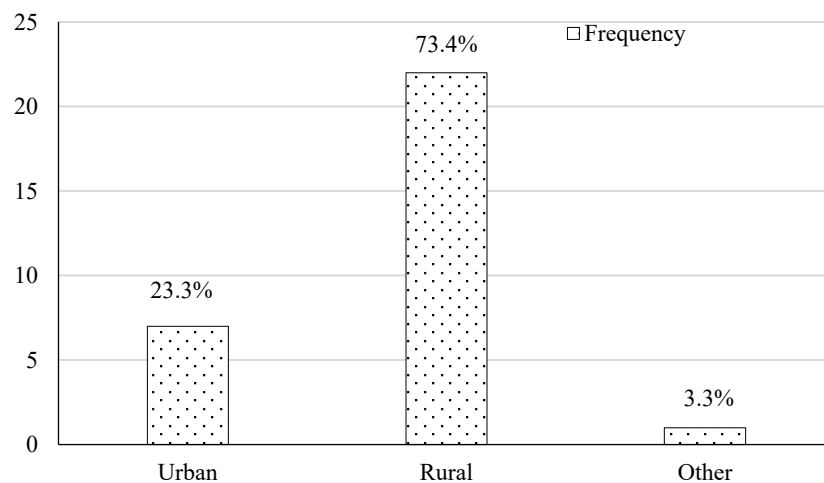
Figure 1. Histogram showing distribution of frequency and percentage of sample based on area of residence (n=30).
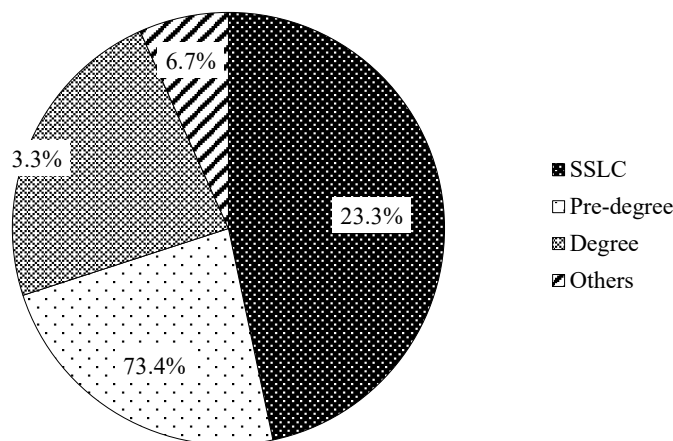
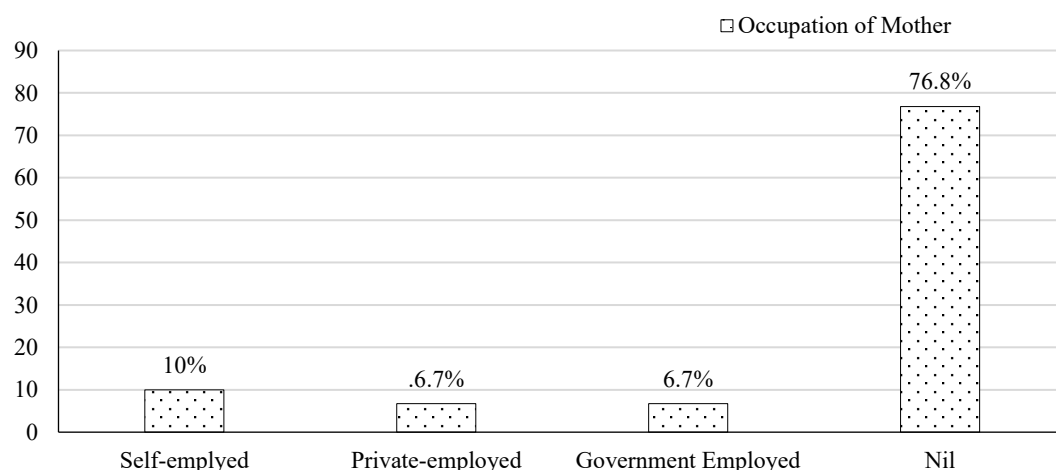**Figure 2.** Pie diagram showing distribution and percentage of samples based on education of father (n=30).

Figure 3 depicts that out of 30 second semester BSc Nursing students, 6 (20%) of the mothers studied upto SSLC, 18 (60%) studied upto Pre–degree, 5 (16.7%) are Graduates, and only 1 (3.3%) attained higher education.
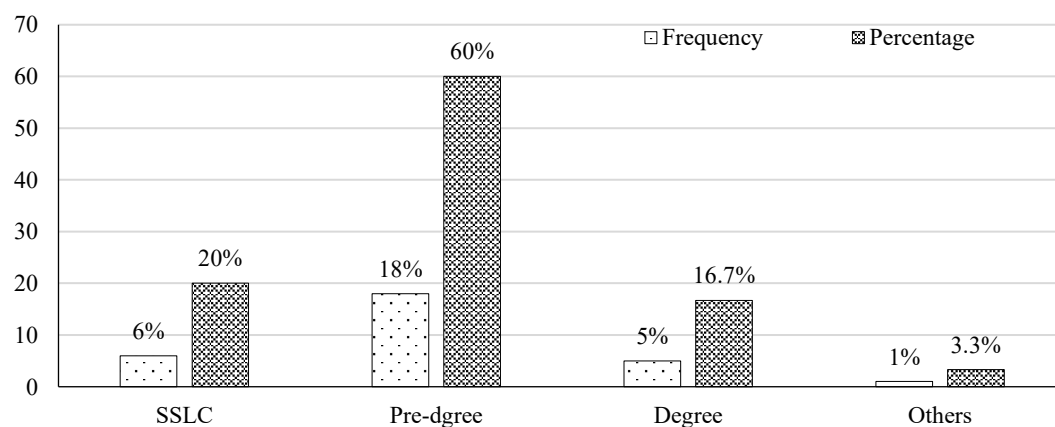
Figure 3. Bar diagram showing distribution and percentage of samples based on education of mother (n=30).

Table 3 illustrates that, out of 30 second semester BSc Nursing students, 1 (3.3%) of fathers are Government employed, 7 (23.4%) are Private employed, 18 (60%) are Self-employed and 4 (13.3%) are unemployed.

Figure 4 shows that, out of 30 second semester BSc Nursing students, 3 (10%) of the mothers are Self-employed, 2 (6.7%) are Private employed, 2 (6.7%) are Government employed and 23 (76.8%) are homemakers.
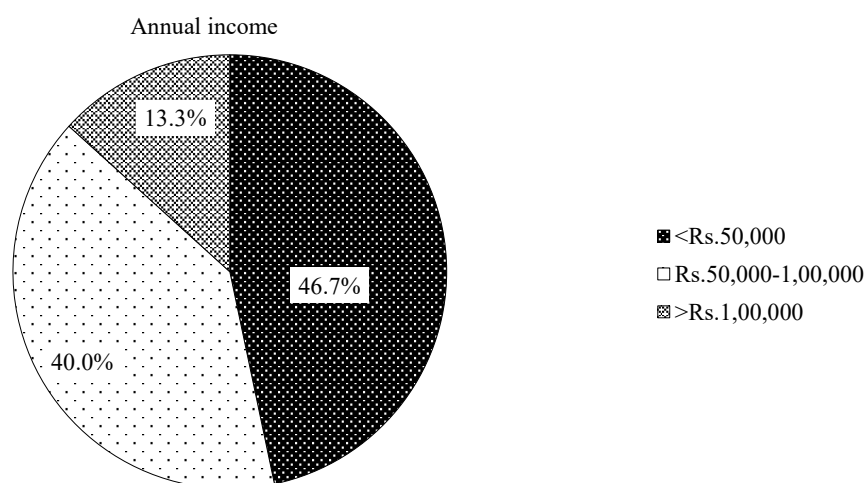

Figure 4. Bar diagram showing distribution and frequency of samples based on occupation of mother (n=30).

Table 3. Distribution of frequency and percentage of sample based on occupation of father (n=30).

Variables	Characteristics	Frequency (f)	Percentage (%)
Occupation of father	Self employed	18	60
	Private employed	7	23.4
	Government employed	1	3.3
	Nil	4	13.3

Figure 5 shows that, out of 30 second semester BSc Nursing students, 14 (46.7%) have annual family income <50,000, 12 (40%) have annual family income between 50,000–1,00,000 and 4 (13.3%) have annual family income >1,00,000 rupees.

Figure 5. Pie diagram showing distribution of frequency and percentage of samples based on annual family income (n=30).

Table 4 illustrates that, out of 30 second semester BSc Nursing students, 28 (93.3%) were studied in state syllabus, 2 (6.7%) studied in CBSE and there is no one from ICSE or VHSE.

Table 4. Distriution of frequency and percentage of samples based on stream of education in plus two.
(n = 30)

Variables	Characteristics	Frequency (f)	Percentage (%)
Stream of Education	State	28	93.3
In Plus Two	CBSE	2	6.7
	ICSE	0	0
	VHSE	0	0

Section 2
Frequency and Percentage Distribution of Level of Knowledge Regarding ECG and its Basic Interpretations
In order to assess the existing level of knowledge regarding ECG and its basic interpretations, structured knowledge questionnaire was administered. The comparison between pre-test and post-test knowledge was identified and presented in following table;

Table 5. Comparison between pre-test and post-test knowledge of ECG and its basic interpretations.
(n = 30)

S.N.	Knowledge score	Pre-test frequency (f)	Pre-test percentage (%)	Post-test frequency (f)	Post-test percentage (%)
1	Very poor	2	6.7	0	0
2	Poor	26	86.6	0	0
3	Average	2	6.7	3	10
4	Good	0	0	19	63.3
5	Very good	0	0	8	26.7

Data presented in Table 5 indicates that in pre-test, out of 30 students 2 (6.7%) had very poor knowledge, 26 (86.6%) had poor knowledge, 2 (6.7%) had average knowledge and no one had good or very good knowledge during pre-test. Whereas, in post-test none of them had very poor or poor knowledge, 3 (10%) had average knowledge, 19 (63.3%) had good knowledge and 8 (26.7%) had very good knowledge regarding ECG and its basic interpretations.

Section 3
Effectiveness of Structured Teaching Programme on Knowledge Regarding ECG and its Basic Interpretations
The effectiveness of structured teaching programme on knowledge regarding ECG and its basic interpretation among second semester BSc Nursing students was identified by the computation of mean, mean difference and standard deviation which is depicted in the table.

Table 6. Mean, standard deviation, mean difference and calculated 't' value to compare pre-test and post-test knowledge regarding ECG and its basic interpretation among second semester BSc Nursing students.

Knowledge score	Mean	Mean Difference	Standard Deviation	Degree of freedom	't' value
Pre-test Post-test	10.23 26.7	16.7	3.43	29	25.77

The data presented in Table 6 shows that paired 't' test was used to compare pre-test and post-test level of knowledge of second semester BSc Nursing students on ECG and its basic interpretations. The mean pre-test score was 10.23 which are lower than the post test score of 26.7 with mean difference of

16.47. At 5% level of significance the calculated 't' value was 25.77. Since calculated value is greater than table value, test is significant statistically, reject null hypothesis (H0), Accept research hypothesis (H1) and (H2), that there is a significant difference noted before and after administration of the structured teaching programme.

From this it can be said that structured teaching programme was effective in increasing the knowledge level of second semester BSc Nursing students regarding ECG and its basic interpretations.

Section 4
Association on Level of Existing Knowledge of Students Regarding ECG and its Basic Interpretations with Selected Socio-Demographic Variables

This section attempt to study the association of pre-test level of knowledge among second semester BSc Nursing students with selected socio-demographic variables like gender, area of residence, education of father, education of mother, occupation of father, occupation of mother, annual income, stream of education in plus two and previous knowledge about ECG and its basic interpretations.

Data presented in Table 7 illustrates that the calculation of chi-square value was more than table value at 5% level of significance for demographic variable; gender. Thus it can be proved that there was no significant association between the existing level of knowledge and selected socio-demographic variables except gender.

Table 7. Association between the existing level of knowledge of students regarding ECG and its basic interpretations with selected socio-demographic variables.

S.N.	Demographic Variables	X^2	Degree of Freedom	Table Value	Inference
1	Gender	38.400	2	5.99	Significant
2	Area of Residence	1.615	4	9.488	Not Significant
3	Education of Father	9.195	6	12.592	Not Significant
4	Education of Mother	3.056	6	12.592	Not Significant
5	Occupation of Father	2.438	6	12.592	Not Significant
6	Occupation of Mother	10.555	6	12.592	Not Significant
7	Annual Income	3.656	4	9.488	Not Significant
8	Stream of Education in Plus Two	0.323	6	12.592	Not Significant
9	Previous Knowledge	1.245	2	5.991	Not Significant

DISCUSSION

An ECG is an integral part of the initial evaluation of a patient suspected of having a cardiac-related problem. Knowledge about ECG and its interpretation helps in improving inter-professional teamwork and collaboration to enhance the delivery of quality care to patients. Improving the competency of ECG interpretation among healthcare providers who work in emergency settings is a potential patient safety issue and could minimize interpretation errors during emergency situations [7]. A research study was undertaken at the Nursing College in Indore to evaluate the impact of a structured teaching program on the knowledge of 'electrocardiogram' among nursing students. The sample size consisted of 30 participants, selected through non-probability purposive sampling. The research utilized a structured questionnaire as the instrument to assess the level of knowledge among nursing students regarding ECG in the Indore region. This study revealed that majority of samples had poor knowledge (63%) and very few of them had good knowledge (7%) whereas the level of knowledge in very poor range is (30%). Moreover, there were no any single respondent set in excellent and very good category of knowledge in the pre-test. In the post test most of the students had good knowledge level, which indicated the importance of educational intervention that were effective in improving the student's knowledge [8]. The present study was focused on the effectiveness of structured teaching programme on knowledge regarding ECG and its basic interpretation among second semester BSc Nursing students in a selected

college of nursing in Pathanamthitta district. As it is evident from the above mentioned study that the structured teaching programme helps in improving the knowledge, the present study also focused to improve the knowledge of the participants using structured teaching programme. Quantitative research approach was used in a study to assess knowledge on ECG Interpretation among UG Students [9]. Nonprobability purposive sample of 49 undergraduate final year nursing students were taken. The result showed 38% students had poor knowledge whereas the average knowledge regarding ECG interpretation among UG students is 24.48% and only 6.1% had good knowledge regarding ECG interpretation. The study concluded that there is need to implement periodic educational interventions and training programs on ECG among nursing students[9]. Present study revealed that out of 30 students 2 (6.7%) had very poor knowledge, 26 (86.6%) had poor knowledge, 2 (6.7%) had average knowledge and no one had good or very good knowledge during pre-test. A research investigation aimed at evaluating the effectiveness of a Structured Teaching Programme on knowledge related to ECG interpretation among second-year B.Sc. Nursing students involved the selection of sixty participants using a non-probability consecutive sampling technique. In the initial assessment (pre-test), none of the participants demonstrated a high level of knowledge. Instead, 4 (6.7%) exhibited average knowledge, while the majority, 56 (93.3%), displayed poor knowledge In the post-test, 9 (15%) had good knowledge, whereas 26 (43.3%) samples had average knowledge and 25 (41.7%) of them had poor knowledge. The researchers concluded that there is an increased level of knowledge in post-test as compared with pre-test. Thus the structured teaching programme was effective [10]. Present study revealed that, mean pre-test knowledge score was 10.23 and the mean post-test knowledge was 26 This suggests that the effectiveness of the structured teaching program on understanding ECG and its fundamental interpretation was successful in improving the knowledge scores. A study was conducted by Grzegorz Kopeć, Wojciech Magoń, Mateusz Hołda and Piotr Podolec to assess the 'Competency in ECG Interpretation Among Medical Students' by enrolling 536 medical students (females: n=299; 55.8%), aged 19 to 31 (23±1.6) years from all Polish medical schools [11]. The results revealed that 86.7% of female students had good knowledge and there is a significant association between gender and knowledge on ECG and its basic interpretations. In this study, there is a significant association between existing level of knowledge and gender. "At a significance level of 5%, the computed value amounted to 38.4 which were greater than table value 5.99. Hence chi-square is significant. Other socio demographic variables like area of residence, education of father, education of mother, occupation of father, occupation of mother, annual income, stream of education in plus two are not significant as the calculated value is less than the table values for all these socio-demographic variables [12].

CONCLUSION

Globally, cardiovascular diseases stand as the primary contributor to mortality. An estimated 17.9 million people die from cardiovascular disease in 2020, representing 32% of all the global deaths. 85% of these deaths were due to heart attack and stroke[12]. It is essential to establish clear ECG interpretation competencies for all healthcare professionals to address the issue of diminishing proficiency in ECG literacy. The competency of health care workers to record and interpret ECG for the diagnosis of pathological disorders can help prevent and reduce mortalities related to caediovacular diseases. Today's student nurses are tomorrow's registered nurses. Educating them regarding ECG helps in providing quality emergency care. The preparation of a nurse is vital to offer proper care to the patient affected by cardiologic alterations. The implication of these findings might help to provide support to nursing students with emergency management so that they can respond to cardiac emergencies with more confidence. More over this will help enhance preparedness to emergencies when providing care.

The primary objective of this study was to assess the efficacy of a structured teaching program concerning knowledge about ECG and its fundamental interpretations among second-semester BSc Nursing students. The conceptual framework employed in this research was based on Imogene King's theory. The chosen research design was a quantitative one-group pre-test post-test design. Formal written approval was obtained from the principal of Holy Cross College of Nursing, Adoor. A total of 30 students meeting the inclusion and exclusion criteria were selected through purposive sampling. Subjects were briefed on the study's purpose and nature, and their consent was obtained. Pre-test was

conducted by using structured knowledge questionnaire to assess existing knowledge regarding ECG and its basic interpretations. Then structured teaching programme which includes systematically developed teaching session aided with PowerPoint and video demonstration was given for duration of 45 minutes. It was followed by post-test with the same knowledge questionnaire after 3 days. Majority of the study subjects were unaware of ECG and its basic interpretations. The administration of structured teaching programme helped to improve level of knowledge among second semester BSc Nursing students regarding ECG and its basic interpretations. The study results also revealed that prexisting knowledge regarding ECG and its basic interpretation had association with only gender among socio demographic variables.

Recommendations
- A study may be conducted using other strategies like video teaching, live demonstrations etc.
- A similar study can be conducted for relevant information in a large sample size.
- A comparative study can be conducted with different population and setting.
- A study may be conducted to assess the practice of interpreting ECG abnormalities.

REFERENCES
1. A. Sreenivas Kumar and Nakul Sinha; Cardiovascular diseases in India; Med J Armed Forces India; 2020 76(1); 1–3 https://www.ncbi.nih.gov/pmc/articles
2. Javed Ansari and Davinder Kaur; Textbook of Medical-Surgical Nursing I; P.V publishers; Part-B; 808–809.
3. N Papagerogiou, D Singer and C G Missouris; A study to assess the prevalence of ECG abnormalities and their relation to patient characteristics; International Journal of Nursing Research; Issue 6; volume-4; 11–13; 2019.
4. 4.Shiny P George and Caroline Joseph; A study to assess the effect of planned teaching programme about ECG and its basic interpretation on knowledge and practice among staff nurses working in selected hospital, Ambikapur, Chattisgarh; Kerala Nursing Forum; Volume 14; Issue 2; 25–28.
5. Sasikala A, Latha Venkatesan and Sasikala D; A study to assess the knowledge and practice on ECG skills among emergency nurses at selected hospital Chennai: Kerala nurses forum; volume-8; Issue 3; 11–15.
6. Brunner & Suddarth; Textbook of Medical-Surgical Nursing; 13thedition; Wolter Kluwer publishers; vol 1; 694–695.
7. Lewis; Medical-Surgical Nursing; 3rd southasia edition; Elsevier publishers; vol 1; 626–27.
8. Deepak Kumary Swamy; A study to assess the effectiveness of structured teaching programme on knowledge of ECG among nursing students; pubmed; PMID: 26541993; 2019.
9. Ms. Arpita khander and Dr Sindhu thoma; A study to assess knowledge on ECG interpretation amongUG students 2018; Research Paper E – ISSN NO. 2454-996; Volume 4; Issue 9; 125–129.
10. Juby Rose Kuriakose, Sr. Hemalatha mary, Anmol Susee prabha, Ashly Sebastin, Blessy Jesline and Merin lilly james; A structured teaching programme on knowledge regarding ECG interpretation among second year BSc Nursing students; Pubmed: DOI 10.52711 123492996; 2022 Volume12; Issue-3.
11. Grzegorz kopec, Wojciech Ng Magen, Matesciz Holda and piotr Podules; A study to assess the Competency in ECG interpertation among medical students; Pubmed: PMC4638278; 2019.
12. Mary Lucita and Aleyamma Eapen; Cardiovascular Nursing; 2nd edition; Elsevier publishers; 137–160.