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A STUDY TO ASSESS THE EFFECTIVENESS OF A STRUCTURED TEACHING PROGRAM ON ENHANCING THE INTERPRETATION OF ARRHYTHMIAS IN ELECTROCARDIOGRAMS AMONG HEALTHCARE WORKERS AT LIONS HOSPITAL, MEHSANA.

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Abstract: This study aimed to assess the effectiveness of a structured teaching program on enhancing the interpretation of arrhythmias in electrocardiograms among healthcare workers. A quantitative pre-experimental one-group pre-test and post-test design was used among 60 participants at Lions General Hospital selected through convenient sampling. Data were collected using a structured questionnaire, followed by a teaching intervention and post-test after seven days. The results showed that the majority (66.7%) had inadequate knowledge in the pre-test, whereas 58.3% achieved adequate knowledge in the post-test. The mean score improved significantly from 10.5 ± 3.2 to 18.9 ± 2.8 ($p < 0.001$). A significant association was found between pre-test knowledge and variables such as educational qualification and previous ECG training. The study concluded that the structured teaching program was effective in improving ECG interpretation knowledge among healthcare workers.

1. INTRODUCTION

Cardiovascular diseases (CVDs) are the leading cause of death globally, accounting for approximately 17.9 million deaths each year, representing 32% of all global deaths. In India, the burden of CVD has increased significantly due to lifestyle changes, urbanization, and rising prevalence of risk factors such as hypertension, diabetes, and obesity. Early identification and timely management of cardiac conditions are crucial to reduce mortality and morbidity associated with these diseases.[1]

The electrocardiogram (ECG) is a non-invasive, cost-effective, and widely used diagnostic tool for assessing the electrical activity of the heart. It provides essential information about heart rate, rhythm, and conduction abnormalities. The basic components of an ECG include the P wave, QRS complex, and T wave, each representing specific electrical events in the cardiac cycle. Accurate interpretation of these components is fundamental for diagnosing various cardiac conditions.[2]

Cardiac arrhythmias refer to abnormalities in the rate, rhythm, or conduction of the heartbeat. Common arrhythmias include atrial fibrillation, ventricular tachycardia, bradycardia, and heart blocks. These conditions may arise due to underlying heart disease, electrolyte imbalance, drug toxicity, or other systemic conditions. Some arrhythmias are benign, while others can be life-threatening and require immediate intervention.[3]

The clinical importance of arrhythmia interpretation lies in its role in early diagnosis and prompt management of potentially fatal cardiac events. Timely recognition of arrhythmias can prevent complications such as stroke, cardiac arrest, and sudden cardiac death. In emergency and critical care settings, rapid ECG interpretation is essential for initiating life-saving interventions and improving patient outcomes.[4]

Healthcare workers, particularly nurses and allied health professionals, play a vital role in continuous cardiac monitoring and early detection of arrhythmias. Nurses are often the first to observe ECG changes and must be competent in recognizing abnormal patterns. Physicians rely on accurate ECG interpretation for diagnosis and treatment decisions, while other healthcare workers support monitoring and patient care.[5]

Despite the importance of ECG interpretation, several studies have reported inadequate knowledge and skills among healthcare professionals. Many nurses and allied staff face difficulties in identifying complex arrhythmias, leading to delays in diagnosis and treatment. This highlights a significant gap in clinical competency and emphasizes the need for ongoing education and training programs.[6]

A structured teaching program (STP) is an organized educational intervention designed to improve knowledge and skills through planned instruction. It may include lectures, demonstrations, audio-visual aids, and practical sessions. STPs are widely used in healthcare education to enhance learning outcomes and ensure uniformity in knowledge dissemination among participants.[7]

Previous research has demonstrated that structured teaching programs are effective in improving ECG interpretation skills among healthcare workers. Educational interventions have been shown to significantly increase knowledge scores and confidence levels in identifying arrhythmias. Continuous professional education is therefore essential to maintain competency and ensure high-quality patient care.[8]

In the context of Lions Hospital, Mehsana, there is a growing need to enhance the ECG interpretation skills of healthcare workers due to increasing cardiac cases and workload. Limited access to regular training programs may contribute to knowledge deficits among staff. Therefore, implementing a structured teaching program can be an effective strategy to improve competency and ultimately enhance patient outcomes.[9]

2. MATERIALS AND METHODS

2.1 Study Design

A pre-experimental one-group pre-test and post-test design was adopted to assess the effectiveness of a structured teaching program on ECG arrhythmia interpretation.

2.2 Study Setting

The study was conducted at Lions General Hospital, a multi-specialty healthcare facility providing cardiac care services.

2.3 Study Population and Sample

The study population consisted of healthcare workers, including nurses, doctors, physiotherapists, and nursing assistants. A total of 60 participants were selected using a non-probability convenient sampling technique.

2.4 Inclusion and Exclusion Criteria

Inclusion Criteria:

- Healthcare workers available during data collection
- Willing to participate

Exclusion Criteria:

- Those who had undergone recent ECG training
- Those not available during the study period

2.5 Data Collection Tool

A structured questionnaire was used:

- **Section A:** Demographic variables
- **Section B:** Knowledge questionnaire on ECG and arrhythmias

Each correct response was scored as 1 and incorrect as 0.

2.6 Intervention

A **structured teaching program** was administered, covering:

- Basics of ECG
- Normal ECG waveform
- Identification of common arrhythmias
- Clinical interpretation

Teaching methods included lecture, visual aids, and discussion.

2.7 Data Collection Procedure

- Pre-test conducted using questionnaire
- Structured teaching program administered
- Post-test conducted after 7 days

2.8 Statistical Analysis

- Descriptive statistics: frequency, percentage, mean, SD
- Inferential statistics: paired t-test and chi-square test
- Significance level set at $p < 0.05$

1.9 Ethical Considerations

- Institutional ethical approval obtained
- Permission from hospital authorities
- Written informed consent obtained
- Confidentiality maintained

3. RESULTS

TABLE 3.1: FREQUENCY AND PERCENTAGE DISTRIBUTION OF SOCIO-DEMOGRAPHIC VARIABLES (N = 60)

S. No	Variable	Category	Frequency (f)	Percentage (%)
1	Age (years)	21–30	20	33.3%
		31–40	18	30%
		41–50	12	20%
		>50	10	16.7%
2	Gender	Male	25	41.7%
		Female	35	58.3%
3	Qualification	Diploma	15	25%
		Graduate	30	50%
		Postgraduate	15	25%
4	Experience	<5 years	22	36.7%
		5–10 years	20	33.3%
		>10 years	18	30%
5	Department	ICU	15	25%
		General ward	25	41.7%
		OPD	10	16.7%
		Others	10	16.7%
6	Previous ECG Training	Yes	18	30%
		No	42	70%

The data presented in Table 3.1 show that the majority of participants (33.3%) were in the age group of 21–30 years, followed by 31–40 years (30%). Most of the participants were female (58.3%), while 41.7% were male. Regarding educational qualification, 50% were graduates, and 25% each had diploma and postgraduate qualifications. In terms of experience, 36.7% had less than 5 years of experience, followed by 33.3% with 5–10 years. The majority of participants (41.7%) were working in general wards, and 25% in ICU. Notably, 70% of participants had not received any previous ECG training, indicating a potential gap in skill development.

TABLE 3.2: **DISTRIBUTION OF PRE-TEST AND POST-TEST KNOWLEDGE LEVELS AMONG HEALTHCARE WORKERS (N=60)**

Knowledge Level	Pre-test (f)	Pre-test (%)	Post-test (f)	Post-test (%)
Inadequate	40	66.7%	5	8.3%
Moderate	15	25%	20	33.3%
Adequate	5	8.3%	35	58.3%

TABLE 3.2 REVEALS THAT DURING THE PRE-TEST, THE MAJORITY OF PARTICIPANTS (66.7%) HAD INADEQUATE KNOWLEDGE, WHILE ONLY 8.3% HAD ADEQUATE KNOWLEDGE REGARDING ECG ARRHYTHMIA INTERPRETATION. AFTER THE STRUCTURED TEACHING PROGRAM, THERE WAS A MARKED IMPROVEMENT, WITH 58.3% OF PARTICIPANTS ACHIEVING ADEQUATE KNOWLEDGE AND ONLY 8.3% REMAINING IN THE INADEQUATE CATEGORY. THIS INDICATES A SIGNIFICANT ENHANCEMENT IN KNOWLEDGE LEVELS FOLLOWING THE INTERVENTION.

TABLE 3.3: COMPARISON OF PRE-TEST AND POST-TEST MEAN KNOWLEDGE SCORES (N = 60)

Test	Mean	Standard Deviation (SD)	Mean Difference	t-value	p-value
Pre-test	10.5	3.2	8.4	15.2	<0.001*
Post-test	18.9	2.8			

*Highly significant at $p < 0.05$ level

Table 3.3 shows that the mean pre-test knowledge score was 10.5 (SD = 3.2), which increased to 18.9 (SD = 2.8) in the post-test. The mean difference of 8.4 indicates a substantial improvement in knowledge after the structured teaching program. The calculated t-value (15.2) was found to be highly significant ($p < 0.001$), demonstrating that the intervention was effective in enhancing ECG interpretation knowledge among healthcare workers.

TABLE 3.4: ASSOCIATION BETWEEN PRE-TEST KNOWLEDGE SCORES AND SELECTED SOCIO-DEMOGRAPHIC VARIABLES (CHI-SQUARE TEST) (N = 60)

Variable	Category	χ^2 Value	df	p-value	Significance
Age	21–30, 31–40, 41–50, >50	5.12	3	0.16	NS
Gender	Male, Female	2.01	1	0.15	NS
Qualification	Diploma, Graduate, PG	6.85	2	0.03	Significant
Experience	<5, 5–10, >10 yrs	4.22	2	0.12	NS
Department	ICU, Ward, OPD, Others	3.95	3	0.27	NS
Previous ECG Training	Yes, No	7.10	1	0.008	Significant

Table 3.4 indicates that there was a statistically significant association between pre-test knowledge scores and certain demographic variables such as educational qualification and previous ECG training. Participants with higher qualifications and prior training demonstrated better knowledge levels. However, no significant association was found between pre-test knowledge and variables such as age, gender, experience, and department. This suggests that educational background and prior exposure play a key role in knowledge levels.

4. DISCUSSION

The present study evaluated the effectiveness of a structured teaching program on enhancing the interpretation of arrhythmias in electrocardiograms among healthcare workers. The findings revealed a significant improvement in knowledge levels following the intervention. These findings are consistent with several previous studies conducted in similar settings.

A study conducted by **Alghamdi et al. (2020)** reported that nurses who underwent a structured ECG teaching program demonstrated a significant increase in knowledge and confidence in interpreting cardiac arrhythmias. The post-test scores were significantly higher than pre-test scores, supporting the effectiveness of educational interventions in improving clinical competencies. This finding is in line with the present study, where a notable improvement was observed after the structured teaching program.[10]

Similarly, a study by **Feroze et al. (2017)** assessed the knowledge and skills of nurses in ECG interpretation and found that a majority of participants had inadequate knowledge prior to training. After educational intervention, there was a marked improvement in their ability to correctly identify arrhythmias. These results strongly support the findings of the current study, where most participants initially demonstrated poor knowledge, which improved significantly after the intervention.[11]

Another study by **Kavitha and Jamuna (2018)** examined the effectiveness of a structured teaching program on ECG interpretation among staff nurses and found a statistically significant difference between pre-test and post-test scores. The study concluded that structured teaching programs are effective tools for improving knowledge and should be incorporated into regular in-service education. This aligns closely with the results of the present study.[12]

A quasi-experimental study conducted by **Sharma and Kaur (2019)** also demonstrated that educational interventions significantly improved nurses' knowledge regarding cardiac arrhythmias. The authors emphasized the importance of continuous professional development programs in enhancing clinical skills, which is consistent with the findings of the current study.[13]

Furthermore, a study by **Thomas et al. (2021)** highlighted that prior training and higher educational qualifications were significantly associated with better knowledge levels in ECG interpretation. This finding is supported by the present study, where a significant association was observed between pre-test knowledge scores and variables such as educational qualification and previous ECG training.[14]

Overall, the findings of the present study are in agreement with previous research, indicating that structured teaching programs are highly effective in improving knowledge and interpretation skills related to ECG and cardiac arrhythmias. The consistency of results across different studies strengthens the validity of the current findings and emphasizes the need for regular training programs in healthcare settings.

5. CONCLUSION

The study assessed the effectiveness of a structured teaching program on ECG arrhythmia interpretation among healthcare workers at **Lions General Hospital**. The findings showed that most participants had inadequate knowledge in the pre-test.

After the intervention, there was a significant improvement in post-test knowledge scores, indicating that the structured teaching program was effective. A significant association was also found between pre-test knowledge and variables such as educational qualification and previous ECG training.

In conclusion, the structured teaching program effectively improved ECG interpretation knowledge among healthcare workers, and such programs should be regularly implemented to enhance clinical competence and patient care.

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7. CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this research article.

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