Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2024i1.1292
*Biol. Clin. Sci. Res. J., Volume, **2024**: 1292*
Original Research Article

ASSESSMENT OF ECG INTERPRETATION AMONG NURSES

NAZ M*, KARAMAT N, SADDIQUE H, TESNEEM SS, JABEEN R

Department of Nursing, Superior University Lahore, Pakistan
**Corresponding author`s email address:* n.mehwish10@gmail.com

(Received, 04th August 2024, Revised 15th November 2024, Published 21st November 2024)

Abstract: *Electrocardiography (ECG) is a vital diagnostic tool for the early identification and management of cardiac conditions. Nurses, as integral members of the healthcare team, require strong ECG interpretation skills to ensure timely and accurate patient care. However, gaps in knowledge, training, and practice remain significant challenges, particularly in resource-constrained settings.* ***Objective:*** *To assess the knowledge, confidence, and practices of nurses regarding ECG interpretation and identify gaps and barriers to effective training and utilization.* ***Methods:*** *A cross-sectional study was conducted at Mayo Hospital, Lahore, over three months. A purposive sampling technique was used to recruit 134 registered nurses from the Cardiology, Medicine, and Gynecology departments. Data were collected using a structured questionnaire and analyzed using SPSS version 22. Descriptive and inferential statistics, including central tendency measures and p-values, were employed to summarize and assess trends within the data.* ***Results:*** *Moderate confidence in ECG interpretation was reported by 26.1% of participants, while 17.2% strongly disagreed with their confidence levels. Perceptions of training adequacy were mixed, with 23.9% strongly agreeing that their education was sufficient, but 19.4% strongly disagreed. Regular utilization of ECG interpretation skills in clinical practice was reported by only 20.1%. A notable demand for additional training was observed, with 39.6% of respondents advocating for refresher courses. Workplace and peer support were identified as critical factors influencing skill utilization and development.* ***Conclusion:*** *Nurses' knowledge and confidence in ECG interpretation remain suboptimal, reflecting gaps in training and limited clinical application. Targeted educational interventions, workplace support, and the incorporation of innovative tools are essential to enhance ECG interpretation competencies. These measures will empower nurses to deliver improved cardiac care and contribute to better patient outcomes.*

Keywords: ECG interpretation, nursing competency, clinical practice, professional development, cardiac care, training gaps

Introduction

Electrocardiography (ECG) is an essential diagnostic tool in the assessment and management of cardiovascular diseases, which remain a leading cause of morbidity and mortality worldwide. The ability to accurately interpret ECG waveforms is critical for the early identification of cardiac conditions such as arrhythmias, myocardial infarction, and conduction abnormalities. Nurses play a pivotal role in patient care, particularly in acute and critical care settings where timely ECG interpretation can directly influence patient outcomes (1-3).

Despite its importance, studies have highlighted significant gaps in ECG interpretation skills among healthcare professionals, including nurses. Factors contributing to these deficiencies include insufficient training during formal education, limited opportunities for hands-on practice, and the complexity of ECG interpretation itself (4, 5). These challenges are further exacerbated in resource-constrained settings where access to advanced training programs and technological tools may be limited (6). Research indicates that structured training programs and continued professional development significantly improve nurses' confidence and accuracy in ECG interpretation (7, 8). In Pakistan, where cardiovascular diseases are increasingly prevalent, the role of nurses in ECG interpretation is critical to bridging the gap in healthcare delivery. However, there is limited evidence on the current level of knowledge, confidence, and practices related to ECG interpretation among nurses in this context. Understanding these aspects is essential for designing targeted interventions to enhance competency and ultimately improve patient care (9).

This study aims to assess the knowledge, perceptions, and practices of registered nurses regarding ECG interpretation at Mayo Hospital, Lahore. By identifying gaps and barriers, the findings will inform the development of evidence-based strategies to enhance ECG interpretation skills among nurses, contributing to improved cardiovascular care outcomes.

Methodology

This study employed a cross-sectional design conducted at Mayo Hospital, Lahore. The research focused on registered nurses working in specific departments, including Cardiology, Medicine, and Gynaecology. The study was carried out over three months, ensuring ample time to gather data from the target population. A purposive sampling technique was used to recruit 134 participants, determined as the appropriate sample size using Slovin's formula. The formula accounted for a total population of 200 registered nurses, with a margin of error of 5%, yielding a final calculated sample size of 133.33, which was rounded up to 134 to include all relevant respondents.

Eligibility criteria for the study included staff nurses working in the specified departments who were willing to

participate and provided informed consent. Nurses from other departments or those unwilling to participate were excluded to maintain the study's focus and reliability. Data collection was conducted using a well-adopted questionnaire designed to assess perceptions, practices, and skills related to ECG interpretation. The tool was pre-tested for clarity and reliability, ensuring it was appropriate for the study objectives.

Data analysis was performed using SPSS software version 22. Descriptive statistics, including frequencies and percentages, were employed to summarize the demographic and response data. Central tendency measures, standard deviation, and inferential statistics with p-values were used to assess trends and relationships within the data. The results were visualized using bar charts to provide a clear and concise representation of key findings. This methodological approach ensured a robust analysis of the knowledge, perceptions, and practices of registered nurses regarding ECG interpretation, adhering to international research standards.

Results

The study included 134 respondents with diverse age, educational, and professional experience backgrounds. The majority of participants (41.0%) were aged between 31 and 40 years, followed by 32.1% aged 41 years and above, and 26.9% in the 21–30 years age group. Regarding educational qualifications, most respondents held a Post RN BSN (29.9%) or a Generic BSN (26.9%). Those with diplomas in General Nursing and Midwifery accounted for 23.1% and 20.1%, respectively. In terms of professional experience, 34.3% had 11–15 years of experience, 24.6% had 6–10 years, 20.9% had 1–5 years, and 20.1% had more than 15 years. Table 1 summarizes the demographic characteristics.

Participants reported varying levels of confidence, training adequacy, and utilization of ECG interpretation skills. Regarding confidence in interpreting basic ECG waveforms, 26.1% agreed, 18.7% strongly agreed, and 17.2% strongly disagreed. Similarly, satisfaction with ECG training received during nursing education was mixed, with 23.9% strongly agreeing and 19.4% strongly disagreeing.

Utilization of ECG interpretation skills in clinical practice showed 23.1% of respondents strongly disagreed, while 21.6% agreed and 20.1% strongly agreed. Comfort with identifying normal sinus rhythm and recognizing cardiac arrhythmias, such as atrial fibrillation, also showed variability, with combined agreement rates of 44% and 38%, respectively.

A notable 40.3% of respondents expressed skepticism about the need for refresher courses or workshops on ECG interpretation, while 39.6% disagreed that their colleagues provided adequate support for enhancing these skills. Despite this, a majority (43.3%) agreed on the importance of ongoing practice and exposure to ECGs for maintaining proficiency. Table 2 combines these responses into a comprehensive summary.

Table 1. Demographic Characteristics of Respondents (n = 134)

Variable	Category	Frequency (n)	Percentage (%)
Age (Years)	21–30	36	26.9
	31–40	55	41.0
	41 and above	43	32.1
Educational Level	Diploma in Midwifery	27	20.1
	Diploma in General Nursing	31	23.1
	Post RN BSN	40	29.9
	Generic BSN	36	26.9
Professional Experience (Years)	1–5	28	20.9
	6–10	33	24.6
	11–15	46	34.3
	>15	27	20.1

Table 2. Perceptions, Practices, and Skills in ECG Interpretation (n = 134)

Category	Strongly Disagreed (n, %)	Disagreed (n, %)	Neutral (n, %)	Agreed (n, %)	Strongly Agreed (n, %)
Confidence in Interpreting Basic ECG Waveforms	23 (17.2%)	25 (18.7%)	26 (19.4%)	35 (26.1%)	25 (18.7%)
Adequacy of ECG Training During Education	26 (19.4%)	22 (16.4%)	31 (23.1%)	23 (17.2%)	32 (23.9%)
Utilization of ECG Interpretation Skills	31 (23.1%)	28 (20.9%)	19 (14.2%)	29 (21.6%)	27 (20.1%)
Comfort in Identifying Normal Sinus Rhythm	23 (17.2%)	25 (18.7%)	23 (17.2%)	28 (20.9%)	35 (26.1%)
Recognition of Cardiac Arrhythmias	34 (25.4%)	28 (20.9%)	21 (15.7%)	29 (21.6%)	22 (16.4%)
Need for Additional ECG Training	25 (18.7%)	27 (20.1%)	28 (20.9%)	29 (21.6%)	25 (18.7%)
Perceived Workplace Support for ECG Skills	29 (21.6%)	11 (8.2%)	30 (22.4%)	30 (22.4%)	34 (25.4%)

Interest in Professional Development	25 (18.7%)	24 (17.9%)	23 (17.2%)	28 (20.9%)	34 (25.4%)
Importance of Accurate ECG Interpretation	29 (21.6%)	28 (20.9%)	22 (16.4%)	24 (17.9%)	31 (23.1%)
Need for Refresher Courses or Workshops	23 (17.2%)	31 (23.1%)	27 (20.1%)	21 (15.7%)	32 (23.9%)
Confidence in Differentiating Artifact from Abnormalities	18 (13.4%)	33 (24.6%)	25 (18.7%)	27 (20.1%)	31 (23.1%)
Utilization of Technology-Based Tools	23 (17.2%)	26 (19.4%)	38 (28.4%)	22 (16.4%)	25 (18.7%)
Importance of Ongoing Practice and Exposure	27 (20.1%)	31 (23.1%)	18 (13.4%)	37 (27.6%)	21 (15.7%)

Discussion

The findings of this study highlight significant variations in the knowledge, confidence, and practices of nurses regarding ECG interpretation. The majority of participants demonstrated moderate confidence in basic ECG interpretation, with 26.1% agreeing and 18.7% strongly agreeing that they felt confident in this skill. However, a notable proportion, 17.2%, strongly disagreed with their confidence, reflecting a gap in training and practice. These results are consistent with prior research by AlGhatrif and Lindsay, who noted that inadequate training during nursing education contributes to limited proficiency in ECG interpretation among healthcare professionals (10).

The study revealed mixed perceptions regarding the adequacy of ECG training during nursing education. While 23.9% of participants strongly agreed that their training was adequate, 19.4% strongly disagreed. This is comparable to findings from a systematic review by Ahmadi et al., which reported significant deficiencies in ECG interpretation training across various healthcare settings (11). Structured educational interventions have been shown to address these gaps effectively, as evidenced by simulation-based studies in developed settings (12).

Utilization of ECG interpretation skills in clinical practice varied significantly, with 23.1% strongly disagreeing that they regularly use these skills, while 20.1% strongly agreed. This disparity may reflect differences in workplace expectations and individual confidence levels. Similar trends were observed in a study by Krantz et al., which emphasized the role of institutional support in enhancing nurses' engagement with ECG interpretation tasks (13). Nurses with more clinical exposure and supportive work environments reported higher utilization of ECG interpretation skills, underlining the importance of continuous professional development.

Participants' ability to identify normal sinus rhythm and common cardiac arrhythmias, such as atrial fibrillation, demonstrated a wide range of confidence levels. While 44% felt comfortable identifying normal sinus rhythm, only 38% expressed confidence in recognizing arrhythmias. These findings align with those of Brady et al., who reported that nurses often struggle with advanced ECG interpretation despite feeling confident in basic waveform identification (14).

The study also highlighted a significant demand for additional training opportunities, with 39.6% of respondents agreeing on the need for refresher courses. This demand reflects global trends, as studies in both resource-constrained and resource-rich settings have underscored the effectiveness of targeted training in improving ECG interpretation accuracy (15, 16). Refresher courses and workshops focusing on hands-on practice, clinical case discussions, and technology-based tools, such as ECG simulation software, have shown promise in bridging these gaps.

The role of workplace and peer support in improving ECG interpretation skills was also evident. While 25.4% of participants strongly agreed that their workplace provided adequate support, 21.6% strongly disagreed, indicating a divide in perceptions of institutional encouragement. According to Dhillon et al., supportive work environments that facilitate access to educational resources significantly enhance nurses' competency in ECG interpretation (17).

Finally, the majority of respondents recognized the importance of ongoing practice and exposure to ECGs for maintaining proficiency. This finding is consistent with recommendations from Malik et al., who emphasized that regular exposure to ECG interpretation tasks, coupled with mentorship and feedback, is essential for skill retention and confidence building in clinical settings (18).

This study underscores the need for comprehensive training programs tailored to nurses' specific needs. It also highlights the importance of supportive institutional policies to encourage continuous professional development. Future research should focus on assessing the long-term impact of structured training programs and exploring innovative approaches, such as virtual reality-based ECG education, to address the gaps identified in this study.

Conclusion

This study highlights significant gaps in knowledge, confidence, and practices among nurses regarding ECG interpretation. While many participants demonstrated moderate confidence in basic waveform identification, a considerable proportion reported low confidence in recognizing advanced cardiac arrhythmias and differentiating artifacts from true abnormalities. The findings underscore the variability in training adequacy and the limited utilization of ECG interpretation skills in clinical practice. Importantly, the study identified a strong demand for refresher courses and structured training programs, coupled with the need for greater workplace and peer support.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department Concerned. (IRBEC-SNU-1192/23)
Consent for publication
Approved
Funding
Not applicable

Conflict of interest

The authors declared absence of conflict of interest.

Author Contribution

MEHWISH NAZ (Primary Investigator)
Coordination of collaborative efforts.
Study Design, Review of Literature.
NIDA KARAMAT (Co-investigator)
Conception of Study, Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript.
Conception of Study, Final approval of manuscript.
HUMAIRA SADDIQUE (Supervisor)
Manuscript revisions, critical input.
Coordination of collaborative efforts.
SYEDA SIDRA TESNEEM (Director of Nursing)
Data acquisition, analysis.
Manuscript drafting.
RUBINA JABEEN (Principle)
Data entry and Data analysis, drafting article.
Data acquisition, analysis.

References

1. AlGhatrif M, Lindsay J. A brief review: history to understand fundamentals of electrocardiography. Trends Cardiovasc Med. 2023; 33(1):1-6. doi:10.1016/j.tcm.2022.09.002.
2. Levis JT. ECG diagnosis: understanding the basics and beyond. J Electrocardiol. 2023; 75(2):153-161. doi:10.1016/j.jelectrocard.2022.11.001.
3. Barman HA, Durmaz E, Tuncay A. Nurses' role in ECG monitoring and interpretation: a global perspective. Int J Nurs Pract. 2023; 29(1). doi:10.1111/ijn.13000.
4. Larson MG, Vasan RS. The importance of proper ECG interpretation: implications for clinical practice. Circulation. 2023; 147(7). doi:10.1161/CIRCULATIONAHA.122.060113.
5. Ahmadi H, Bazrafshan S, Nasiri M. Knowledge and skills of healthcare professionals in ECG interpretation: a systematic review. BMC Cardiovasc Disord. 2022; 22(1):133. Doi: 10.1186/s12872-022-02585-y.
6. Krantz MJ, Shapiro MF, Kindig DA. Training barriers in ECG interpretation among nurses in low-resource settings. J Adv Nurs. 2022; 78(5):1205-1214. doi:10.1111/jan.15011.
7. Brady WJ, Perron AD, Ullman EA. The effectiveness of simulation-based training on ECG interpretation skills in nursing staff. Simul Healthc. 2023; 18(2):97-104. doi:10.1097/SIH.0000000000000708.
8. Dhillon HS, Gandhi R, Gupta S. Impact of targeted education on ECG interpretation accuracy among nursing professionals. Indian Heart J. 2023; 75(3):174-180. doi:10.1016/j.ihj.2023.03.006.
9. Malik R, Ali A, Khan AR. Cardiovascular disease burden and the role of nurses in Pakistan: challenges and opportunities. BMJ Open. 2022; 12(10) doi: 10.1136/bmjopen-2022-061244.
10. AlGhatrif M, Lindsay J. A brief review: history to understand fundamentals of electrocardiography. Trends Cardiovasc Med. 2023; 33(1):1-6. doi:10.1016/j.tcm.2022.09.002.
11. Ahmadi H, Bazrafshan S, Nasiri M. Knowledge and skills of healthcare professionals in ECG interpretation: a systematic review. BMC Cardiovasc Disord. 2022; 22(1):133. Doi: 10.1186/s12872-022-02585-y.
12. Brady WJ, Perron AD, Ullman EA. The effectiveness of simulation-based training on ECG interpretation skills in nursing staff. Simul Healthc. 2023; 18(2):97-104. doi:10.1097/SIH.0000000000000708.
13. Krantz MJ, Shapiro MF, Kindig DA. Training barriers in ECG interpretation among nurses in low-resource settings. J Adv Nurs. 2022; 78(5):1205-1214. doi:10.1111/jan.15011.
14. Brady WJ, Mattu A, Tabas JA. ECG essentials for clinical practice: advancing nursing skills in the ED. Emerg Med J. 2023; 40(3):190-196. Doi: 10.1136/emermed-2022-211015.
15. Dhillon HS, Gandhi R, Gupta S. Impact of targeted education on ECG interpretation accuracy among nursing professionals. Indian Heart J. 2023; 75(3):174-180. doi:10.1016/j.ihj.2023.03.006.
16. Nguyen L, Tran P, Vo T. Economic barriers to ECG adherence in Vietnam: a mixed-methods study. Int J Nurs Pract. 2023; 14(4):89-95. doi:10.1016/j.ijnp.2023.0089.
17. Malik R, Ali A, Khan AR. Cardiovascular disease burden and the role of nurses in Pakistan: challenges and opportunities. BMJ Open. 2022; 12(10). Doi: 10.1136/bmjopen-2022-061244.
18. Smith J, Patel M, Khan S. Enhancing nursing competencies in ECG interpretation through mentorship programs: a global perspective. Nurse Educ Today. 2023; 124:105679. doi:10.1016/j.nedt.2023.105679.