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Nurses' knowledge and practice regarding cardiac arrhythmia detected from electrocardiogram

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Abstract--Background: Electrocardiogram is one of the most powerful diagnostic tools in modern medicine use to evaluate arrhythmias, with an estimated 300 million ECGs performed annually in the USA alone. Aim: The aim of this study to evaluate nurses' knowledge and practice regarding cardiac arrhythmia detected from Electrocardiogram. Methods: Tools of data collection are: Two tools were used as the following: Tool (I): Nurses' self-administered questionnaire, Tool 2 An observation checklist. Results: More than half of the studied nurses were females in age group from (17-24). About two thirds of the studied nurses were graduated from nursing institute, while only of them had a diploma in nursing. There was a statistically significant difference among the studied nurses knowledge, practices and ECG training courses. There was a negative correlation between nurses knowledge level, practices level and ECG training courses. Conclusion: Electrocardiography interpretation is very crucial for health care professionals. ECG is a non-invasive procedure which commonly formed in medicine and emergency departments. The results of present study showed that more than three quarters of the studied nurses had unsatisfactory knowledge level, while less than one quarter of them had satisfactory knowledge regarding cardiac arrhythmia detected from ECG. Recommendations Establishing of self-Learning Modules beside training courses for improving Nurses' knowledge and Practice Regarding Cardiac Arrhythmia Detected from Electrocardiogram. Continuous evaluation of nurses' knowledge and practice is essential to identify their needs about cardiac arrhythmias.

Keywords--knowledge, cardiac arrhythmia, electrocardiogram, practice.

Introduction

The human heart contracts approximately 2.5 billion times during the average person's lifespan; this is accomplished by the cardiac conduction system, which consists of the sinoatrial (SA) node, atrioventricular (AV) junction and AV node, a bundle of His and Purkinje fibers. The Normal conduction of a cardiac impulse is generated in the sinus (SA) nod which is the natural pacemaker of the heart and the only normal rhythm of the heart is a normal sinus rhythm (Dzikowicz & Carey, 2020).

Cardiac arrhythmia is defined as any cardiac rhythm other than normal sinus rhythm. In other words, Arrhythmia refers to any disturbance in the rate, regularity, site of origin, or conduction of the cardiac electrical impulse. arrhythmia occurs when the heart's natural pacemaker (the SA node) becomes defective; the normal conduction pathway to the AV node and the ventricles is interrupted; another part of the heart takes over as pacemaker (Roberts, 2021). Electrocardiogram is one of the most powerful diagnostic tools in modern medicine use to evaluate arrhythmias, with an estimated 300 million ECGs performed annually in the USA alone. ECG is a recording of the heart's electrical activity by placing electrodes on the skin, that evaluating heart rhythm as it is one of the first steps in the interpretation of the 12-lead ECG, Interpretation of ECG is known as an important clinical skill for quick diagnosis of potential life-threatening arrhythmia. Therefore, nurses should have sound expertise in Arrhythmia interpretation (Kashou et al., 2020).

Nursing staff are responsible for both the technical aspects of monitoring ECG (e.g. positioning the electrodes, setting the alarm parameters) and the clinical decisions based on the information obtained from the monitor and ECG paper. Nurses must have sufficient knowledge to perform these procedures in collaboration with the physician. In particular, nurses should be able to record 12-lead ECG and correctly interpret it in order to start treatment as soon as possible, leading to better clinical outcomes (Rubbi et al., 2021).

Significance of the Study

Cardiac Arrhythmias are one of the most complexes, insufficiently studied, and therefore one of the most urgent problems of modern cardiology (Zatonskaya et al., 2017), Cardiovascular diseases (CVDs) are the leading cause of death globally. An estimated 17.9 million people died from CVDs in 2019, representing 32% of all global deaths. with increasing numbers of patients requiring cardiac monitoring each year. (Kaptoge et al., 2019). The electrocardiogram examination is one of the most frequently performed diagnostic tests. Early Correct interpretation of the ECG, particularly in life-threatening ventricular dysrhythmias may influence the decisions on appropriate actions and consequently have an impact on the lives and health of patients. It is important for nurses to acquire this skill (Stopa et al., 2017).

Nurses play a critical role in arrhythmia identification and management. The current practice is that nurses gather data, and notify the physician, as well as

preventing complications of arrhythmia through providing a comprehensive nursing care (Ruhwanya et al., 2018).

Subject and Methods

Aim of the study

The aim of this study was to evaluate nurses' knowledge and practice regarding cardiac arrhythmia detected from Electrocardiogram.

Research Questions

The current study answered the following questions

1. What is the nurses' level of knowledge regarding Cardiac Arrhythmia Detected from ECG?
2. What is the nurse's level of practice regarding providing nursing care for patients with Cardiac arrhythmias?

Research design

Exploratory descriptive design Was utilized to achieve the aim of the study.

Study Setting

The study was conducted in the Surgical Intensive Care Unit, Coronary care unit, Emergency Unit at 15 may hospital .it is one of the largest Hospital in Helwan community. Clean Surgical Intensive Care Units it consists of 12 beds, Coronary care units it consists of 9 beds, Emergency Room it consists of 8 beds.

Study Subjects

A convenient sample of all available (60) nurses caring for patients with cardiac arrhythmias and agreed to participate were recruited in this study.

Tools of data collection are: Two tools were used as the following:

- Tool (I): Nurses' self-administered questionnaire (Appendix I): which developed by the investigator based on literature review Tahboub, (2019) it was written in Arabic language and consists of two parts:

Part I: Concerned with demographic characteristic data of nurse under study. It was consisted of 7 closed ended questions such as (age, gender, qualifications, working place, work time and Year of Experience and attendance of training course related to Electrocardiogram).

Part II: Concerned with Nurses' knowledge Regarding Cardiac Arrhythmia. This part comprised of 58 questions which were grouped to 5 subgroups (Knowledge about anatomy and physiology of the heart and conducting system (16 questions), Normal ECG (13 questions), Knowledge related to ECG placement (5 questions), Recognition of the common cardiac arrhythmia (6 ECG Rhythm Strip) and

Assessment of nurse's knowledge about nursing care for patients with arrhythmias (18 questions)).

Scoring system

Scoring System of nurses' knowledge

The response was on scale range from zero (Incorrect answer) to 1 grade (correct answer). A total score for nurses' knowledge was categorized in to unsatisfactory or satisfactory; the total score was 58 and divided in to two categories as follows:

< 85% (< 49 grade) was considered unsatisfactory.

≥ 85% (≥ 49 grade) was considered satisfactory.

- Tool (II): An observation checklist (Appendix II): which adapted and modified by the investigator based on Ibrahim, (2017). was constructed to assess nurses' practice during care for the patient with cardiac arrhythmia, which were grouped to 3 subgroups (ECG placement., Recognition of the common cardiac arrhythmia and Nursing interventions when arrhythmias are recognized)

Scoring system

- The score is determined by the investigator observation which each item is assessed for nurse who provide nursing care for patient with cardiac arrhythmia if done Correctly =2, done incorrectly = 1 and not done=0. the total score was divided in to two categories as follows:
 - < 85% was considered Competence level of Nursing practice.
 - ≥ 85% was considered Incompetence level of Nursing practice.

Content Validity and Reliability

Validity

is whether or not the instrument measures what it is designed to measure.

Reliability

is the consistency of the measurement instrument. The degree to which an instrument measures the same way each time it is used under the same condition with the same subjects.

Pilot study

A pilot study was conducted on 10% (6 nurses) of the study subject in order to test the applicability of the study tools, clarity of the included questions as well as estimation of the average time needed to complete all questions. Results obtained were studied and analyzed. Accordingly, modifications were made for the final development of the study tool. Then the six nurses selected for the pilot study were excluded from the study subjects and replaced by another six nurses.

Field work

Field work includes the following:

- An approval was obtained from a scientific ethical committee of the faculty of nursing at Helwan University and the study subjects individually using a written informed consent obtained from each participant prior to data collection.
- Field work included interviewing with all available nurses caring for patients with cardiac arrhythmias in the previously mentioned clinical settings to explain the aim of the study.
- Assessing nurses' knowledge and practice Regarding Cardiac Arrhythmia Detected from ECG. by using nurses' self - administered questionnaire tool, as following:
 - Data collection was done by the Investigator in morning and afternoon shifts for Two days \ week.
 - The self- administered questionnaire tool was filled by the nurses. It takes about 30-35 minutes for every nurse to be fulfilled.
 - The observational checklist was filled by the Investigator for 3 times, using indirect Observation.
 - The both tools were used in the same session.
 - data collection was started and completed within 8 months from April (2021) until the end of November (2021).

Ethical consideration

The ethical research considerations in the study include the following:

- Approval of the study protocol was obtained from the ethical committee in the Faculty of Nursing at Helwan University before starting the study.
- The Investigator Obtained Nurses' approval to participate in the study prior to any data collection orally.
- The Investigator clarified the aim of the study and Tools for the data collection will be.
- The Investigator assured maintaining anonymity and confidentiality of subjects' data.
- Nurses were informed that they are allowed choosing to participate or withdraw from the study at any time without any consequences that the data obtained will be treated confidentially and will be used for the research purpose only.

Result

Table (1): Distribution of the studied nurses according their total knowledge as regards electrocardiogram (n=60)

Knowledge about Electrocardiogram	The studied Nurses (n=60)			
	Correct		Incorrect	
	No	%	No	%
ECG device is used to measure (strength and direction of the heart's electricity)	20	33.3	40	66.7
What is an electrocardiogram (ECG) used for (diagnosis of arrhythmia)	32	53.3	28	46.7
The horizontal line on the ECG paper represents (the Time)	26	43.3	34	56.7
The vertical line on the EKG paper represents (voltage)	18	30	42	70
The P wave represents electrical activity for (contraction of the atria)	15	25	45	75
Represents the width and height of the P wave (2.5 x 2.5 small square)	13	21.7	47	78.3
QRS complex represents electrical activity for (contraction of the ventricles)	19	31.7	41	68.3
The normal distance of each QRS complex is (from 2-3 small squares)	5	8.3	55	91.7
The PR interval represents the distance traveled by the electrical impulse (from the SA node to the AV node)	2	3.3	58	96.7
How to measure PR interval? (from the beginning of the p wave to the beginning of the QRS wave)	8	13.3	52	86.7
The PR Interval normally represents a number of small squares (3-5 small squares)	16	26.7	44	73.3
Each large square contains a number..... a small square (5 small squares)	27	45	33	55
EKG paper each large square equals 0.2 seconds meaning (5 big squares per second)	17	28.3	43	71.7

Regarding nurses' knowledge about electrocardiogram. Table (1) illustrates that the majority of the studied nurses had Incorrect answers regarding the normal distance of each QRS complex, the PR interval represents the distance traveled by the electrical impulse from the SA node to the AV node and how to measure PR interval in percentages (91.7, 96.7 & 86.7), respectively. While More than half (53.3%) of them had Correct answers regarding the used for ECG.

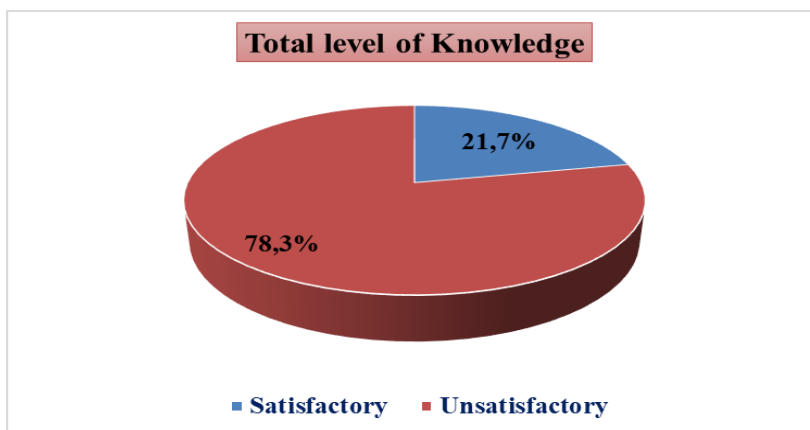


Figure (1): Distribution of the studied nurses according their total level of knowledge regarding cardiac arrhythmia detected from ECG (n=60).

Figure (1) showed percentage distribution of the studied nurses according their total knowledge level about cardiac arrhythmia detected from ECG. It clarified that, more than three quarters of the studied nurses (78.3 %) had unsatisfactory level of knowledge while less than one quarter (21.7 %) of them had satisfactory knowledge regarding cardiac arrhythmia detected from ECG.

Table (2): Distribution of total practices as regards nursing care in case of emergency arrhythmias (VT) and (CPR) (n=60)

Practices about emergency arrhythmias	The studied Nurses (n=60)					
	Done correctly		Done in-correctly		Not done	
	No	%	No	%	No	%
Nursing care for patient with ventricular tachycardia detected: only 4 cases						
Notify doctor.	3	75	0	0	1	25
Administer anti arrhythmic medication.	2	50	0	0	2	50
Being ready for defibrillation.	1	25	0	0	3	75
Being ready for CPR	2	50	0	0	2	50
Document arrhythmias	3	75	0	0	1	25
Nursing care for patient who need for Cardio-pulmonary resuscitation CPR: only 5 cases						
Check patient responsive or unresponsive.	4	80	0	0	1	20
Check carotid pulse and chest movement no more than 10 sec.	3	60	2	40	0	0
No pulse no breath starts chest compression.	4	80	0	0	1	20
Activate the emergency response system (code blue) and get crash cart.	2	40	3	60	0	0
Place patient flat on firm surface (board).	1	20	0	0	4	80
A compression rate of at least 100/min with a compression depth at least 2 inches (5 cm).	1	20	4	80	0	0
Keep arm straight and vertical.	1	20	4	80	0	0
Allow complete recoil between compressions	1	20	4	80	0	0

Obtain an open airway head tilt chin lift.	2	40	3	60	0	0
Use bag and mask technique for ventilating patients, the giving one slow breath (1.5 — 2 seconds).	2	40	3	60	0	0
Prepare for endotracheal intubation.	3	60	2	40	0	0
Resuscitation bag device then connects directly to the endotracheal tube.	5	100	0	0	0	0
If intubated patient should receive continuous compressions while ventilations are given 8-10 times per minute.	1	20	4	80	0	0
Follow up monitoring	4	80	0	0	1	20

Regarding to nurses' practices about nursing care for patient with ventricular tachycardia Table (2) illustrates that half (50%) of the studied nurses administer anti arrhythmic medication correctly and ready for CPR. While, more than two thirds (75%) of them did not ready for defibrillation.

Table (3): Percentage distribution of subtotal level of Nurses practices regarding cardiac arrhythmia detected from ECG (n=60)

Total level of practices	The studied Nurses (n=60)			
	Competent		Incompetent	
	No	%	No	%
ECG placement	8	13.3	52	86.7
Cardiac monitor placement	25	41.7	35	58.3
Nursing intervention when arrhythmias are recognized	9	15	51	85
Nursing care in case of emergency arrhythmias (VT) and (CPR)	1	25	3	75
Nursing care for the patient who is need for defibrillation	1	20	4	80

Table (3) showed the percentage distribution of the studied nurses as regards to their subtotal level of practices regarding cardiac arrhythmia detected from ECG. It clarified that, the studied nurses had incompetent practices level regarding ECG placement (86.7%) while, less than half (41.7%) of them had competent practices level regarding cardiac monitor placement. In addition, about (85%) of the studied nurses had incompetent practices level regarding nursing intervention when arrhythmias are recognized, about 75% of them had incompetent level of practices regarding nursing care in case of emergency arrhythmias (VT) and (CPR). Moreover, 80% of them had incompetent practices level regarding nursing care for the patient who is need for defibrillation.

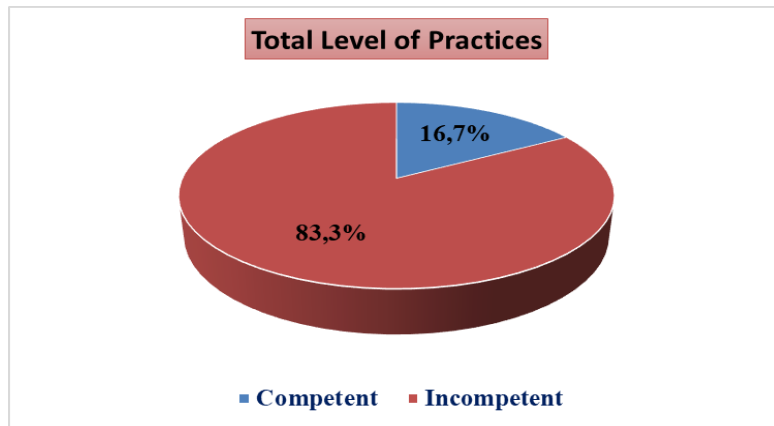


Figure (2): Percentage distribution of the studied nurses according their total level of practices regarding cardiac arrhythmia detected from ECG (n=60)

Figure (2) showed percentage distribution of the studied nurses according their total practices level about cardiac arrhythmia detected from ECG. It clarified that, more than Four fifth of the studied nurses (83.3 %) had incompetent practices level (< 85 %), while less than one fifth (16.7 %) of them had competent practices regarding cardiac arrhythmia detected from ECG.

Table (4): Correlation between nurse's knowledge and practice (n= 60)

Items	Total knowledge		ECG Training Courses	
	Correlation Coefficient	P-value	Correlation Coefficient	P-value
practice	- 0.074	0.04*	- 0.096	0.03*

Table (4) displayed the correlation between total nurses' knowledge level and total practices level regarding cardiac arrhythmia detected from ECG. There was a statistically significant difference among the studied nurses knowledge, practices and ECG training courses (p.value = 0.04 and 0.03). In addition, It revealed that there was a negative correlation between nurses knowledge level, practices level and ECG training courses (Correlation Coefficient = -0.074 and -0.096) at (p-value<0.001).

Table (5): Correlation between total knowledge regarding cardiac arrhythmia detected from ECG according to their total practice and ECG training courses. (n=60)

		Total score of knowledge	Total score of practice	ECG Training Courses
Total score of knowledge	Pearson Correlation		0.074	0.074
	p-value		<0.001**	<0.001**
	N		60	60
Total score of practice	Pearson Correlation	0.074		0.074
	p-value	<0.001**		<0.001**
	N	60		60

Using: Spearman's rank correlation coefficient (rs)

**Highly statistical significant differences (p<0.001).

*A statistical significant difference (p<0.05)

Table (5) presented that, there were highly statistically significant correlation between total score of knowledge regarding Nurses knowledge according to their total score practice. It reveals that there is positive correlation between total score of knowledge and total score of practice at (p-value < 0.001).

Discussion

According to the results of evaluation of the nurses' knowledge of ECG, the majority of the nurses (78.3%) provided incorrect answers to the questionnaire items, which was unsatisfying. The highest percentage of incorrect answers was related to the item which are types of arrhythmias and nursing care provided to patients with cardiac arrhythmias. Similarly, the results of a study conducted in Iraq entitled "Evaluation of nurses knowledge and practice of Electrocardiogram toward adolescent patients" which indicated that most nurses passed the questions regarding knowledge, except for a question concerning ECG changes regarding arrhythmias and it's nursing care plan" (AL-Husaunawy, 2019).

Nurses must have critical thinking and knowledge in detection of arrhythmias in study results. Stanfield (2018) entitled "Improvement of door-to Electrocardiogram time using the first-nurse role in the emergency department" also found that the first intervention of trained nurses in patients with arrhythmias and its management was faster. The study revealed that the majority of the studied nurses had unsatisfactory level of knowledge regarding cardiac arrhythmia. This may be due to workload, lack of concentration and insufficient knowledge, and having more over work hours. These findings are in agreement with a study conducted by Rasha (2018) who studied the effect of an education program on nurses' performance regarding electrocardiography and found that most of the studied nurses had unsatisfactory knowledge regarding cardiac arrhythmia.

Further, these results are in agreement with a study about evaluation of nurses knowledge and practice of electrocardiogram toward adolescent patient, this study stated that nurses had unsatisfactory knowledge on standard of care for patients' with cardiac arrhythmia (Ahmed et al, 2019). At the book of Change (2016)

entitled "Principles of microsurgery" reported that nurses must be able to expand their knowledge through journals and seminars and through teaching programs for nursing staff. These programs should be designed to aid nursing staff in developing and enhancing the skills needed to provide high standards of care to their patients.

Regarding nursing care for patient who need for Cardio-pulmonary resuscitation CPR, the studied nurses activated the emergency response system (code blue) and get crash cart, with a compression rate of at least 100/min with a compression depth at least 2 inches (5 cm), allowed complete recoil between compressions, obtain an open airway head tilt chin lift, use bag and mask technique for ventilating patients, the giving one slow breath (1.5 - 2 seconds) and receive continuous compressions while ventilations are given 8-10 times per minute if the patient intubated incorrectly in percentages (60%, 80%, 80%, 60% & 60%), respectively.

The study revealed that most of the study nurses had incompetent level of practice during their care for the patient with cardiac arrhythmia. This may be due to poor skills and interruptions. These results are in disagreement with Malk (2018) in his study about effect of an education program on nurses' performance regarding Electrocardiography, who found that most of the studied nurses had incompetent practices regarding care of patients with cardiac arrhythmia. The results of the present study revealed that the majority of nurses had incompetent practice levels of Electrocardiography. This might be due to the lack of standardized nursing care.

The current study revealed that there was a significant relation between total nurses' knowledge and their workplace where, the majority of unsatisfactory knowledge was found among nurses working at Emergency Department. Also, there was a significant relation between total nurses' practices and their qualification and workplace, where most of incomplete practices was found among nursing institute which working at Emergency Department. Regarding relation between nurses regarding total knowledge and their practice level, there was a positive relation, that as knowledge level decreases practice level decreases. This result agreed with Hassan and Issa (2019) in their study about nurse's knowledge evaluation theoretical and practical nurses in the electrocardiogram, who stated that there is a positive correlation between the practical with theoretical levels among nurses.

It has been reported Hassan and Issa (2019) that nurses' workplace and ECG training courses had a positive effect on their knowledge. The current study findings showed that the nurses working in the cardiac care unit had the highest average of correct answers, while those working in the surgical intensive care unit had the lowest average of correct answers. From the researcher point of view, it was obviously that nurses who are working in cardiac care unit deals with different cases with different ECG arrhythmias.

Conclusion

Electrocardiography interpretation is very crucial for health care professionals. ECG is a non-invasive procedure which commonly formed in medicine and emergency departments. The results of present study showed that more than three quarters of the studied nurses (78.3 %) had unsatisfactory knowledge level, while less than one quarter (21.7 %) of them had satisfactory knowledge regarding cardiac arrhythmia detected from ECG. It clarified that, more than three quarters of the studied nurses (83.3 %) had incompetent practices level (< 85 %), while less than one quarter (16.7 %) of them had competent practices regarding cardiac arrhythmia detected from ECG.

Recommendations

Based on findings of the current study, the following recommendations were suggested:

- Establishing of self-Learning Modules beside training courses for improving Nurses' knowledge and Practice Regarding Cardiac Arrhythmia Detected from Electrocardiogram.
- Continuous evaluation of nurses' knowledge and practice is essential to identify their needs about cardiac arrhythmias.

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