Original article

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Descriptive cross-sectional survey on the knowledge about dysrhythmias among paramedical healthcare professionals in ICU

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Abstract

***Objective*: To assess the knowledge about dysrhythmias among the paramedical healthcare professionals working in a multidisciplinary intensive care unit (ICU) of a tertiary care hospital.**

***Design*: This was a single-center descriptive cross-sectional survey performed using a self-administered questionnaire.**

***Setting*: This study was carried out in a multidisciplinary ICU of a tertiary care hospital from June to November 2024.**

***Participants*: Nurses, critical care technologists, and nurse practitioners in critical care working in a multidisciplinary ICU were enrolled in the survey. A total of 100 participants who completed the questionnaire were enrolled in the survey.**

***Measurements and results*: The majority of the participants were females (73%), and 58% had less than two years of experience. The overall score of the study cohort was 70.29±16.29, with only 4% able to answer all questions correctly. The observed level of knowledge of the paramedical healthcare professionals was good (above 75%), average (50-75%), and poor (less than 50%) in 45%, 48%, and 7% of participants, respectively. The majority of them were unable to identify ventricular fibrillation and sinus tachycardia, whereas 93% of them could identify the appropriate management for sinus bradycardia. In our study, we found no association between their knowledge and experience in the ICU or with their role in the ICU.**

***Conclusions*: In this study, the participants exhibited varied levels of knowledge in understanding the underlying causes, accurately identifying the dysrhythmia, and management skills with a notable gap in identifying the dysrhythmias.**

Keywords: Dysrhythmia, nurses' knowledge, electrocardiogram, healthcare professionals, survey, questionnaire.

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Introduction

Cardiac dysrhythmia is defined as an abnormality in the heart's rhythm, either timing or pattern of heartbeat. Depending on the type of dysrhythmia, it leads to either a fast or a slow heart rate, and the patient can experience either minor symptoms or sudden cardiac arrest and death.

The global incidence of dysrhythmias in the general population is about 1.5-5% (1) and is as high as 28.8% among critically ill patients. (2) The prevalence of dysrhythmias in India, as evaluated by the PANARrhythMia and Heart Failure Registry (PANARM HF), was 15% bradyarrhythmia and 15% atrial fibrillation. Other supraventricular tachyarrhythmias accounted for 10%, and ventricular

tachycardia/fibrillation contributed 4.5%. (3) However, their prevalence in critically ill patients is not clearly evaluated in the Indian population.

Acute medical conditions - sepsis, acute respiratory failure, acute kidney injury (AKI), electrolyte and hemodynamic disturbances, and acute surgical conditions (trauma and burns, post-general surgery, post-cardiac surgery) were all recognized as risk factors for the development of dysrhythmias in the intensive care unit (ICU) patients. Secondly, hemodynamic alterations arising from dysrhythmia can lead to rapid clinical deterioration of the patient. (2) Thirdly, complications arising from anti-thrombotic and anti-arrhythmic therapies for dysrhythmia can complicate the outcomes in these patients. (4)

Critical illness, in general, leads to impairment of the vital organ's function, leading to life-threatening complications demanding immediate attention. Healthcare professionals involved in the management of ICU patients should be able to promptly identify, evaluate, and treat any life-threatening complication arising during their stay. Given the critical nature of dysrhythmias and the frailty of ICU patients, rapid identification and swift management of dysrhythmias are needed to prevent death or improve patient outcomes.

Therefore, in ICUs, bedside continuous vital signs monitoring includes an electrocardiogram (ECG), and some monitors are equipped with dysrhythmia computer algorithms that raise alarms to detect rhythm disturbances. Despite the availability of such advanced monitoring technologies, the expertise and decision-making skills of healthcare professionals remain pivotal in ensuring optimal patient care.

A 12-lead ECG is a simple bedside test that gives a rapid diagnostic assessment of the majority of the dysrhythmias. Despite being very simple, only a relatively small proportion of medical professionals, including medical graduates, are well-versed in ECG interpretation. (5,6)

Paramedical healthcare professionals have an important role in identifying rhythm disturbances as they are the first point of contact with the patient. In many acute care settings, especially in the era of telemedicine, they act as the first respondents to alert intensive care physicians in the event of any clinical deterioration of the patient following a dysrhythmia. Therefore, they must acquire adequate knowledge to recognize and manage these conditions effectively, as delays or inaccuracies in diagnosis and treatment can lead to severe complications, including stroke, heart failure, and sudden cardiac arrest. This demands them to acquire such competency, and it has been reported in past studies that adequate training of nurses and other healthcare professionals who were involved in the management of ICU patients with dysrhythmias led to timely identification (7,8) and improved outcomes for these patients. (9-11)

In India, there is a paucity of data on the baseline knowledge of the supporting staff in identifying and managing dysrhythmias. Furthermore, there is limited research on the effectiveness of training programs and their impact on clinical practice. This disparity necessitates a thorough assessment of their current knowledge levels to identify the areas which need improvement. Therefore, in this study we intended to assess the knowledge about the dysrhythmias in this subset of people working in a multidisciplinary ICU. In a tertiary care hospital, this knowledge can be utilized to make changes in the training programme conducted for them to enhance their existing knowledge.

Materials and methods

This was a single-centre descriptive cross-sectional survey performed in the multidisciplinary ICU of a tertiary care teaching hospital. It was registered under the Clinical Trials Registry of India (CTRI number: CTRI/2024/06/069363) after obtaining the Institutional Ethics Committee's approval. The study cohort comprised paramedical healthcare professionals - nurses, nurse practitioners in critical care (NPCC), and critical care technologists (CCT) working in the multidisciplinary ICU, and their participation was voluntary. Staff with less than 3 months experience were excluded from the survey. A non-probability convenience sampling method was used to determine the sample size of 100 participants.

Assessment tool

A self-administered questionnaire consisting of two parts was developed for the purpose of the survey. The first part consisted of the gender of the participants and their professional details – designation and ICU experience (in years). The second part consisted of 14 questions that tested their knowledge about etiopathogenesis, identification of given rhythm strips, and management of dysrhythmia. Based on the scores, they were categorized as having good (above 75%), average (50-75%), and poor (less than 50%) knowledge.

All the paramedical healthcare professionals involved in patient care at the multidisciplinary ICU of the hospital were approached. The details and purpose of the study were clearly explained to them, and consent was obtained from those willing to participate in the survey. Questionnaires with incom-

plete responses were excluded, and the enrolment was completed after reaching 100 responses. Data was entered into a Microsoft Excel sheet for statistical analysis.

Statistical analysis

The data was entered into an Excel sheet for statistical analysis. Categorical data and individual participant scores were expressed as numbers and percentages. Continuous data was expressed as mean with standard deviation, and statistical significance was checked by applying the independent t-test and chi-square test as appropriate.

Results

The survey was conducted on 100 participants who filled out the questionnaire completely, with the majority being females (73%). The study cohort was comprised mostly of junior staff nurses and technologists (44%) and was relatively new, with less than two years of experience (58%) in ICU care (**Figures 1A, 1B, 1C**).

The knowledge of the study cohort was average (less than 75%) with a mean±standard deviation (SD) score of 70.29±16.29, and they demonstrated variable levels of competency in categorizing into three domains (**Table 1**). Out of the 100 participants, only four (4%) answered all questions correctly, although 45% (n=45) of them demonstrated good knowledge (score above 75%). Of the remaining participants, 48 had average knowledge, while seven staff performed poorly, with a score below 50% (**Figure 2**).

The results of the study showed that their knowledge of the etiopathogenesis of dysrhythmias was good, with a mean score of 76.83±21.17, and 32 participants were able to answer all six questions correctly. Ninety percent of participants responded correctly to question 13 (etiology of torsades de pointes). Their ability to identify the given rhythm strip was average (59.75±24.07), with only eight staff able to identify all four rhythm strips. The most correctly identified rhythm abnormality was atrial flutter (74%), but the majority failed to recognize ventricular fibrillation with only 23 correct responses. Their competency in selecting the appropriate first-line treatment of dysrhythmias was also average, with 14 participants able to answer all four questions correctly, while four participants did not give any correct response. The majority of them provided correct responses (93%) for the treatment of sinus bradycardia (**Table 2** and **Figure 3**).

However, when we looked for the association between their experience in the ICU or their role assigned in the ICU with competency in understanding dysrhythmias, we could not find any significant difference (**Tables 3** and **4**).

Discussion

The present survey was conducted to assess the understanding of etiopathogenesis and competency in interpreting and managing dysrhythmias by the paramedical healthcare professionals working in the multidisciplinary ICU of a tertiary care hospital. The predominance of junior staff with less than two years of work experience seen in our study was noted even in the past studies. (12-14)

In our study, the overall capability of the participants was found to be average and was in concordance with the studies by Aljohani (13) and Ho et al., (15) who reported a performance score of 6.8 and 7.7 on a scale of 10, respectively. However, in their studies, a higher percentage of participants (14.9% and 12.5%, respectively) provided appropriate responses to all the questions in contrast to only 4% seen in our study. The probable reason for the discrepancy was in the above studies, 94.9% and 97.9% of participants, respectively, attended a training program in ECG interpretation, basic life support (BLS), or advanced cardiac life support (ACLS), even though they could not find a positive association between this training and their capability in ECG interpretation. Contrary to our study findings, nurses in the study by Coll Badell et al. (16) demonstrated high competency in ECG interpretation, with more than 50% answering all questions correctly, and nurses with prior ECG training courses within the last five years displayed significantly high ECG knowledge than those who had not received such training. The systematic review by Chen Y et al. (17) confirmed that the level of competency exhibited by nurses in understanding the ECGs was variable.

Our study participants exhibited an average competence in identifying the abnormal rhythm strips, with four of them unable to identify any dysrhythmia. Notably, 77% of them failed to recognize ventricular fibrillation, and 31% missed sinus tachycardia. The inability to identify critical dysrhythmias is a serious concern because ventricular fibrillation is an arrest rhythm and needs immediate initiation of the ACLS algorithm. Equally important is the fact that they need to differentiate serious dysrhythmias from physiological responses like sinus tachycardia. The deficiency of knowledge among the participants in identifying rhythm strips seen in our study was congruent with other studies. In their study, Ruhwanya et al. (12) found that 39% of their nurses failed to identify ventricular fibrillation, while Keller et al. (18) highlighted that their study cohort

found it most difficult to identify tachyarrhythmias and heart blocks. In the study by Aljohani (13), a significant proportion of nurses displayed difficulty identifying atrial and ventricular fibrillation, complete heart block, and atrial flutter. In the study by Tahboub and Dal Yilmaz, (19) nearly 85% of nurses identified atrial flutter coinciding with our result.

Regarding the awareness of the first-line therapies for dysrhythmias in critically ill patients, the majority of our participants were able to respond appropriately to the management of sinus bradycardia, a dose of atropine, and shockable rhythm. However, they encountered difficulty in identifying the emergency drug therapy for atrial fibrillation, with only 20% accurate responses. This finding suggested a knowledge gap in their identification and practical application skills, which may impair their safe participation in patient management. Contrarily, the studies by Ruhwanya et al. (12) and Aljohani (13) revealed the overall low competence of their nurses in identifying the first-line therapy of dysrhythmias corresponding to their ability to identify abnormal rhythm strips. The probable reason for this disparity could be the difference in the difficulty level of the question, particularly the management of complete heart blocks, ventricular fibrillation, ventricular tachycardia, and atrial fibrillation.

Contrary to the findings from studies by Zhang et al. (8) and Buluba et al., (20) who demonstrated that work area experience improved their dysrhythmia identification knowledge, we could not demonstrate a correlation between the experience of the paramedical healthcare professionals or their role assigned in the ICU and their dysrhythmia knowledge.

Limitations

The study, being a single-center cross-sectional survey from a multidisciplinary ICU, did not represent nurses from other acute care settings like the emergency department, coronary and neuro-care units, and technologists of other specialties of our institute. Also, it did not consider the difference in the competency of a varied group of paramedical healthcare professionals due to the differences in their curriculum and teaching training programs.

Conclusion

The findings of our study reiterate that the level of knowledge of the paramedical healthcare professionals in evaluating the dysrhythmias was poor. It emphasizes the need to improve their ability to correctly recognize the ECG for prompt and appropriate holistic patient management. This provides us with future directions in research for conducting training programs along with periodic pre- and post-training assessments to identify their weaknesses, provide suggestions to strengthen their curriculum and observe the change in their ability to evaluate the ECG. Hence, longitudinal studies with multicentre recruitment of a larger population may be conducted to evaluate their level of knowledge and provide conclusions.

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Table 1. Overall score of the participants (n=100) under each domain tested

Knowledge domain	Score (mean±SD)
Complete, (n=14)	70.28±16.29
Etiology, (n=6)	76.83±21.17
Identification, (n=4)	59.75±24.07
Management, (n=4)	71±18.37

Legend: SD=Standard deviation.

Table 2. Percentage of correct responses for each question by the participants

Question	Correct answer	Correct response (%)
Knowledge on etiopathogenesis		
1. Definition of arrhythmia	Refers to any problem in the rate or rhythm of heart beat	68
3. Identify supraventricular arrhythmias	None of the above	79
11. Statement: Arrhythmias are the reflection of cardiac diseases like ischemia, valvular disease, infective disease, etc.	True	74
12. Statement: Tachyarrhythmia arising from the atria or the atrio ventricular junction is a supraventricular tachycardia.	True	68
13. Identify cause for torsades de pointes	All of the above	90
14. Identify the possible causes of arrhythmias in patients in ICU	Hypoxemia, hypotension and cardiac ishchemia	84
Identifying arrhythmia		
2. Identify the electrocariographic strip	None of the above	71
4. Identify the electrocariographic strip	Ventricular fibrillation	23
5. Identify the electrocariographic strip	Atrial flutter	74
6. Identify the electrocariographic strip	Sinus tachycardia	69
Management of arrhythmia		
7. Appropriate therapy for rhythm control of atrial fibrillation	Amiodarone	20
8. Appropriate first line management of sinus bradycardia	Atropine	93
9. Appropriate dose of atropine in sinus bradycardia	Maximum dose of 3 mg	85
10. Recognize shockable rhythms	Ventricular fibrillation	86

Legend: ICU=Intensive care unit.

Table 3. Comparison of the participants' experience and level of knowledge

Experience (years)	Mean score	Standard deviation	p-value
<2	9.67	2.37	0.278
2-5	9.91	2.19	
6-10	10.31	2.19	
11-17	10.14	2.12	

Table 4. Comparison of the participants' role in ICU and level of knowledge

Experience	Average score	Standard deviation	p-value
Junior staff nurse	9.36	2.18	0.98
Staff nurse	10.03	2.6	
Senior staff nurse	10.25	1.54	
Technologist and NPCC	11.14	1.68	

Legend: ICU=Intensive care unit; NPCC=Nurse practitioner in critical care.

Figure 1A. Distribution of participants by gender

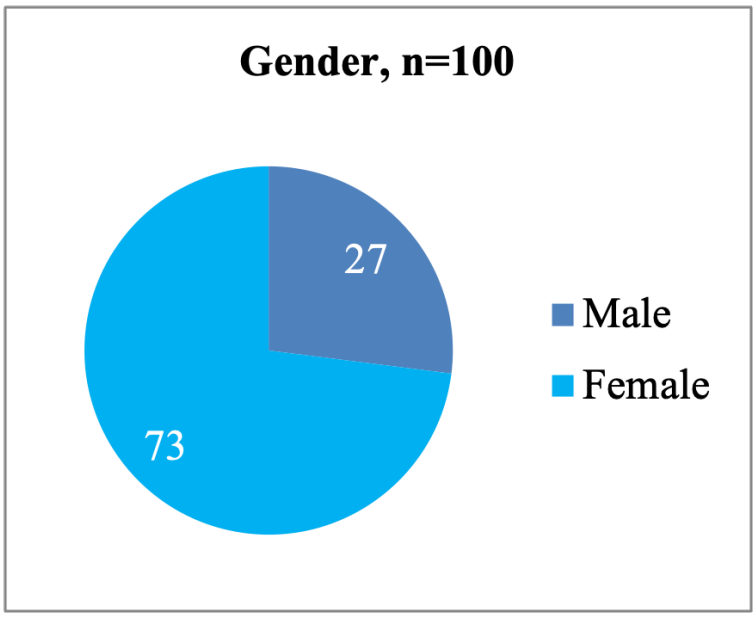
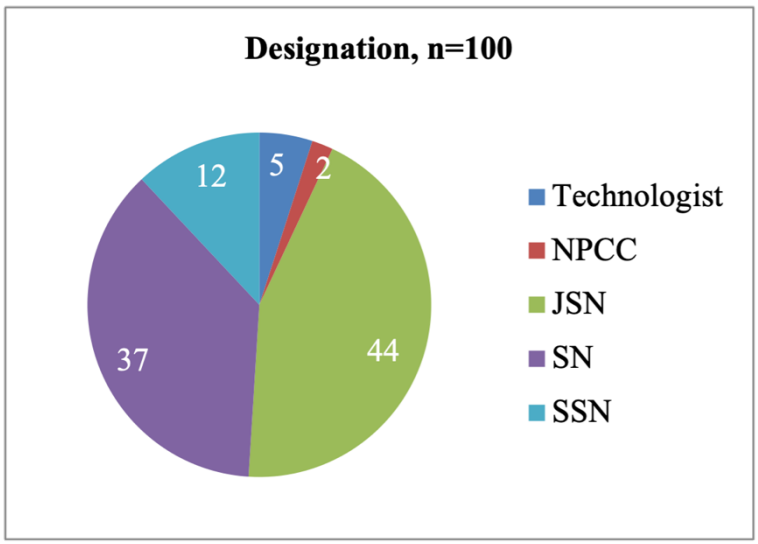


Figure 1B. Distribution of participants by designation



Legend: NPCC=Nurse practitioner in critical care; JSN=Junior staff nurse; SN=Staff nurse; SSN=Senior staff nurse.

Figure 1C. Distribution of participants by experience

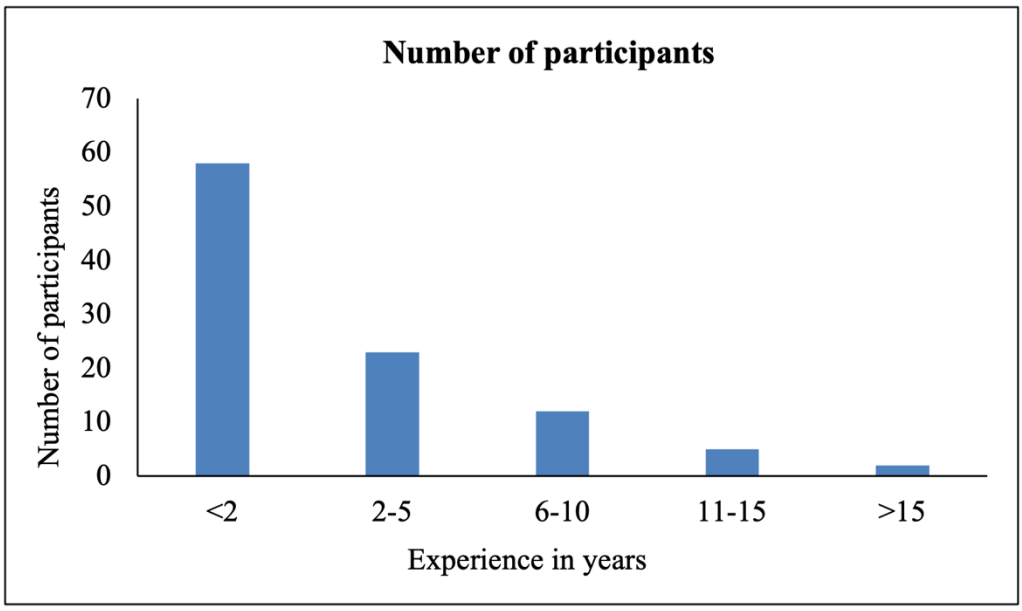


Figure 2. Distribution of study cohort according to their score (n=100)

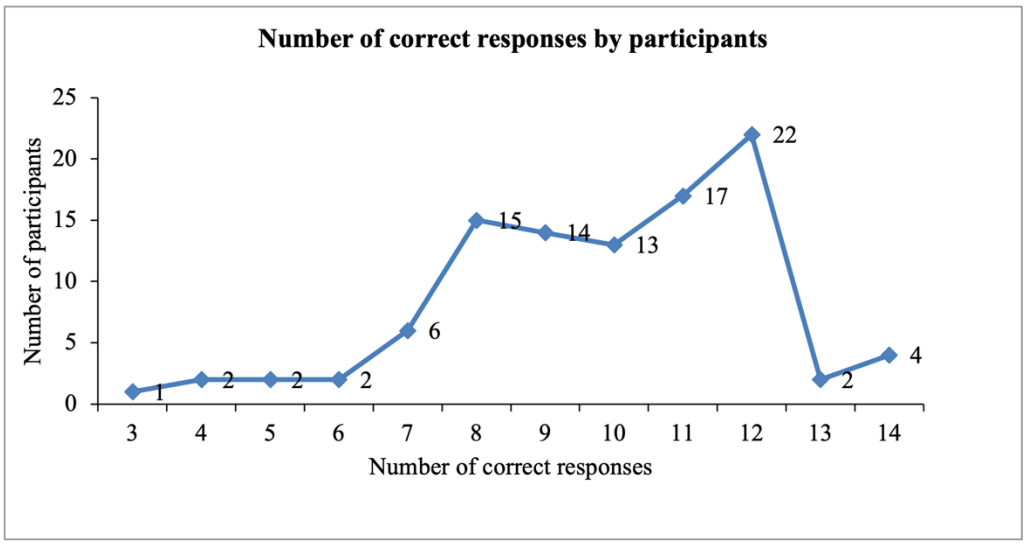
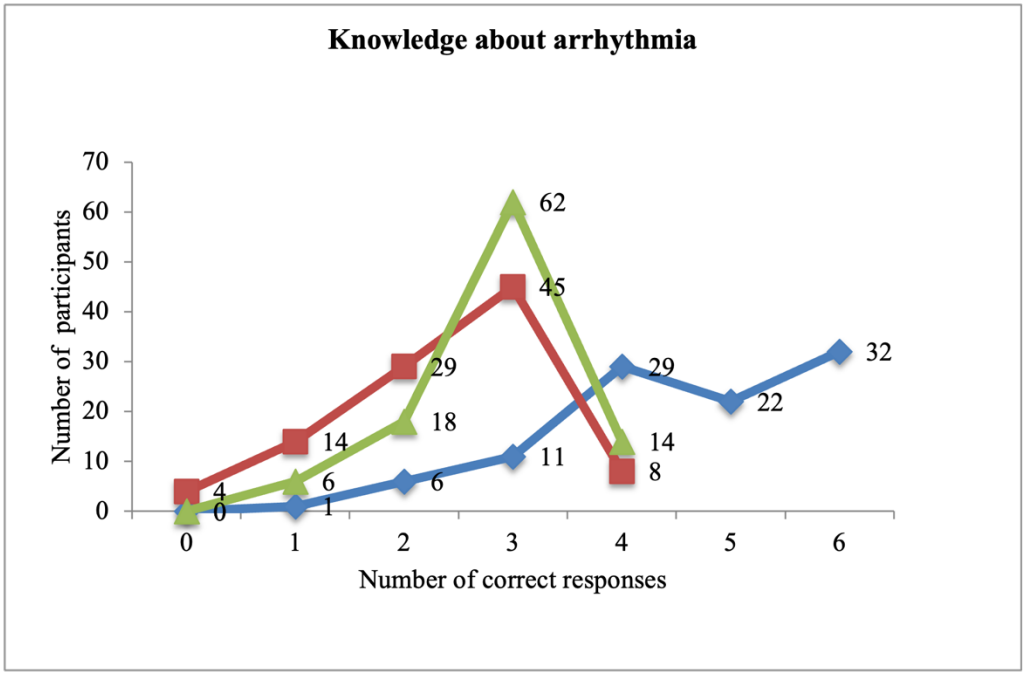


Figure 3. Distribution of the study cohort according to their responses under each knowledge domain assessed (n=100)



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