Assessment of the Knowledge Level of Paramedics Who Serve in Pre-Hospital Emergency Medicine, Regarding the Diagnosis and Treatment of Wide QRS Complex Tachycardia

Hastane Öncesi Acil Sağlık Hizmetlerinde Görev Yapan Paramediklerin Geniş QRS'li Taşikardilerin Tanı ve Tedavi Konusundaki Bilgi Düzeylerinin İncelenmesi

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ABSTRACT

Aim: This study was conducted to investigate the knowledge level of paramedics who work in pre-hospital emergency medicine services in the Konya province, about the diagnosis and treatment of wide QRS complex tachycardia.

Material and Methods: The study sample consisted of 140 paramedics working in emergency health service stations affiliated with the Konya Provincial Ambulance Service. The data were collected through a questionnaire prepared by the researcher inquiring about the diagnosis and treatment of wide QRS complex tachycardia and the demographic characteristics.

Results: With the questionnaire, the definition of tachycardia and the duration of QRS on normal electrocardiography were inquired. It was found that 22.1% of the paramedics did not know the definition of tachycardia, and almost half of them did not know the basic electrocardiography knowledge including the normal duration of QRS. the questions about ventricular tachycardia, pulseless ventricular tachycardia, stable ventricular tachycardia and treatment of unstable ventricular tachycardia were answered correctly 43.6%,68.6%,62.1% and 29.3% respectively. The knowledge level of paramedics was seen to increase as professional seniority and age increased.

Conclusion: Working years, age, type of high school, and participation in scenario-based simulation training were determined to be the most important factors for correct answers to the questions. In addition, the knowledge level of paramedics about the diagnosis and treatment of wide QRS complex tachycardia was found to be poorer than expected.

Keywords: Pre-hospital care, arrhythmia, paramedic, wide complex tachycardia

ÖZ

Amaç: Bu araştırma Konya ili hastane öncesi acil sağlık hizmetleri istasyonlarında çalışan paramediklerin geniş QRS'li taşikardilerin tanı ve tedavisi konusundaki bilgi düzeylerini incelemek amacıyla yapılmıştır.

Gereç ve Yöntemler: Araştırmanın örneklemini, Konya İl Ambulans Komuta Kontrol Merkezi Başhekimliği'ne bağlı acil sağlık hizmetleri istasyonlarında görev yapan 140 paramedik oluşturmuştur. Verilerin toplanmasında; araştırmacı tarafından hazırlanmış içerisinde demografik verilen de yer alığı geniş QRS'li taşikardilerin tanı ve tedavisi konusunda bilgi düzeyinin incelenmesi anketi kullanılmıştır.

Bulgular: Bu çalışmamızda araştırmaya katılan paramediklere bilgi düzeyi anketinde taşikardinin tanımı ve normal elektrokardiyografide QRS süresi sorulmuş; paramediklerin %22.1'inin taşikardinin tanımını, yaklaşık yarısının ise normal bir elektrokardiyografide olması beklenen QRS süresi gibi elektrokardiyografinin temel bilgilerini bilmedikleri görülmüştür. ventriküler taşkardinin tanısı, nabızsız ventriküler taşikardi, stabil ventriküler taşikardi ve anstabil ventriküler taşikardinin tedavisine yönelik sorular paremaediklerin sırasıyla %43,6 , %68.6, %62.1 ve %29.3'ü tarafından doğru cevaplanmıştır. Çalışmamızda mesleki kıdem ve yaş arttıkça paramediklerin bilgi düzeyinde artış olduğu görülmüştür.

Sonuç: Mesleki kıdem, yaş, mezun olunan lise türü ve senaryo temelli simülasyon eğitime katılım değişkenlerinin sorulara doğru yanıt verilmesindeki en önemli faktörler olduğu belirlenmiştir. Ayrıca; paramediklerin geniş QRS kompleksli taşikardilerin tanı ve tedavisi bilgi düzeyleri beklenenden daha az olmuştur.

Anahtar Kelimeler: Hastane öncesi acil bakım, aritmi, paramedik, geniş kompleks taşikardi

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Introduction

Acting rapidly, making the required interventions, and making critical decisions are of great importance in pre-hospital emergency health services (1).

Wide QRS complex tachycardia is one of the challenging clinical conditions for clinicians. The destructive outcomes of complex electrocardiography (ECG) algorithms, the need for making rapid decisions, and the incorrect approach due to incorrect diagnosis are the reasonable grounds for this concern. If the patient's blood pressure and consciousness state are normal, many physicians mistakenly assume that the tachycardia is of supraventricular origin (2). However, ventricular tachycardias may also appear in this way. The main difficulty is in making the diagnosis in these patients because the risk of sudden death is quite high for a patient who is followed up with a benign supraventricular tachycardia (SVT) diagnosis based only on the clinical condition. Therefore, all patients presenting to the emergency department with a wide QRS complex tachycardia should be considered as ventricular tachycardia (VT) regardless of their clinical status, until proven otherwise (3).

The vast majority of sudden cardiac death cases in the United States are associated with coronary artery disease, but 20% and 40% of sudden cardiac death cases do not have a history of heart disease (4). According to the data on Heart Diseases and Risk Factors in Turkish Adults (TEKHARF), coronary heart diseases take first place among the causes of death with 40% (5). VT and ventricular fibrillation (VF) are considered to be the main rhythms that cause sudden cardiac death in patients with ischemic heart disease (4). In a previous study, 85% of the individuals who experienced out-of-hospital cardiac arrest were detected to have ventricular tachyarrhythmia before collapse developed (6). Wide QRS complex tachycardias take an important place in mortality and morbidity despite current therapeutic approaches and interventions (7). The present study was conducted to investigate the knowledge level of paramedics working in pre-hospital emergency health services about the diagnosis and treatment of wide QRS complex tachycardia.

Material and Methods

The study was planed as cross-sectional and aimed to investigate the knowledge levels of paramedics working in pre-hospital emergency health services on the diagnosis and treatment of wide QRS complex tachycardias.

The study sample consisted of 140 paramedics out of 301 who were working at emergency health service stations of Konya Province Ambulance Services Directorate between February and June 2018 and who agreed to participate.

For the data collection, a questionnaire prepared by the researcher to investigate the level of knowledge about the diagnosis and treatment of wide QRS tachycardias, including demographic data, was used. Consisted of a total of 19 questions it was aimed at determining rhythm recognition and appropriate treatment methods, as well as socio-demographic data including gender, age, high school graduation, working years, participation in advanced life support (ALS) education, and in adult simulation training. The data were collected through face-to-face interviews. There were one missing data about high school graduation in one of the questionnaire ; however, the participant was not excluded as this missing data did not affect study results.

Statistical Analysis

The SPSS version 20 software was used for the data analysis. Descriptive statistics were used in the distribution of the demographic characteristics, and the T-test and the ANOVA were used to analyze the differentiation of the knowledge levels according to the demographic characteristics in wide QRS complex tachycardias. Bonferroni, a posthoc test, was used to determine the differentiating groups in ANOVA. The analyses of the answers given to each question were made with frequency and percentage distributions as descriptive statistical methods. The significance level for all statistics was taken as $p < 0.05$.

Ethical Considerations

Approval was obtained from Konya Provincial Directorate of Health (protocol number: 94723667-806.01.03) and ethics committee approval was obtained from Konya, Selçuk University Non-interventional Clinical Researches Ethics Committee with the decision number 2018/30 and and date of 17/01/2018. Written informed consents were obtained from all participants.

Results

Out of 140 paramedics, 56.4% were women, 36.4% were between the ages of 18-25, 52.1% were Vocational School of Health (VSH) graduates and 52.9% had 6-10 years of professional experience. The majortiy (97.9%) of the participants had received ALS training previously, and 42.9% had received this training 3-5 years ago, 70.7% of them had participated in the simulation training and 53.6% of them had received this training 0-2 years ago (Table 1).

When the relationship between the age, type of high school graduated from, professional seniority, and simulation training variables and the mean score of the wide QRS tachycardia knowledge level questionnaire was examined, it was seen that those with the highest average scores were paramedics aged 31 and over. It was found that the total mean score of the knowledge level questionnaire differed according to the age variable and this difference was found to be significant ($p < 0.05$). It was observed that the significant difference was between groups A and C defined in the table (Table 2).

It was determined that the mean total score differed according to the high school graduated from, this difference was statistically significant and that the mean scores of graduates of VHS were higher (p<0.05) (Table 2).

Characteristics	Number (n)	Percent (%)
Gender		
Female	79	56.4
Male	61	43.6
Age		
18-25 years	51	36.4
26-30 years	45	32.1
31 years and above	44	31.4
Graduation status		
Vocational School of Health (VSH)	73	52.1
Other	66	47.1
Professional seniority		
0-5 years	37	26.4
6-10 years	74	52.9
10 years and above	29	20.7
Status of receiving ALS		
No	3	2.1
Yes	137	97.9
0-2 years ago	52	37.1
3-5 years ago	60	42.9
6-8 years ago	23	16.4
9 years of more	2	1.4
Status of receiving simulation training		
No	41	29.3
Yes	99	70.7
0-2 years ago	75	53.6
3-5 years ago	22	15.7
6-8 years ago	0	0
9 years or more	2	1.4

Table 1. Socio-Demographic Characteristics

When the mean score of the participants according to the professional seniority variable was examined, it was seen that those with the highest mean score had professional seniority of 10 years or more. It was found that the total mean score of the knowledge level questionnaire differed

according to the variable of professional seniority and that this difference was statistically significant (p<0.05). It was observed that there was a significant difference between the A, C, and B, C groups (Table 2).

When the years of paramedics receiving simulation training were examined, it was seen that those with the highest mean score had received this training 3-5 years ago. It was found that the total mean score of the knowledge level questionnaire differed according to the variable of the number of years of receiving the simulation training and this difference was statistically significant (p<0.05). It was observed that a significant difference was between the B and the C groups. Since there were no paramedics who received simulation training 6-8 years ago, they were not included in the analysis (Table 2).

The answers given by the paramedics to the questions regarding the diagnosis and treatment of wide QRS complex tachycardias have been presented in Table 3.

Discussion

Providing and maintaining the vital functions of the patients who need emergency care and also rapid treatment, and stabilization of the patient is possible with well-planned emergency case management. Tachyarrhythmias that create a wide QRS complex can often reveal unstable findings and these places paramedics working in the field in a dynamic decision-making process. The fact that the pre-hospital emergency health services in our country are mainly provided by paramedics reveals the importance of this decision-making process even more.

The present study is the first in the literature, investigating the knowledge level of paramedics in our country about wide QRS complex tachycardias. The study was planned in accordance with the guidelines of the American Heart Association (AHA) 2015 and the European Resuscitation Council (ERC) 2015.

In our study, which was conducted to investigate the knowledge level of paramedics, an integral part of pre-hospital emergency health care, 48.6% of the paramedics were found not to know the QRS duration of in a normal ECG, and 22.1% were found not to know the basic ECG knowledge including the definition of tachycardia. For paramedics, who have important duties and responsibilities such as ECG recording, monitoring, rhythm evaluation, electrical treatments including defibrillation and cardioversion, etc., having an insufficient level of knowledge of basic ECG information such as the definition of tachycardia and the QRS duration in a normal ECG is a significant cause for concern.

In the study, the knowledge level about the diagnosis and treatment of wide QRS complex tachycardias was seen to increase as the age of paramedics increased. This may have resulted from more professional experience and more

Age Groups	n	X	Ss	F	P	Significant difference
18-25 years	51	0.47	0.15	3.46	0.003	A,C
26-30 years	45	0.55	0.19			
31 years and above	44	0.57	0.21			
Total	140	0.53	0.19			
A: 18-25 years, B: 26-30 years, C: 31 years and above						
Graduation	n	X	Ss	F	P	
VSH	73	0.56	0.18	2.33	0.002	
Other	66	0.49	0.19			
Professional seniority	n	X	Ss	F	P	Significant difference
0-5 years	37	0.47	0.18	8.02	0.000	A,C, B,C
6-10 years	74	0.51	0.17			
10 years and above	29	0.65	0.19			
Total	140	0.53	0.19			
A: 0-5 years, B: 6-10 years, C: 10 and above						
Year of receiving simulation training	n	X	Ss	F	P	Significant difference
Not received	41	0.54	0.14	3.78	0.001	B,C
0-2 years ago	75	0.49	0.20			
3-5 years ago	22	0.64	0.18			
6-8 years ago	0	0	0			
9 years or more	2	0.50	0.00			
Total	140	0.53	0.19			

A: Not receiving training, B: Receiving training 0-2 years ago, C: Receiving training 3-5 years ago, D: Receiving training 9 years ago or more

Table 2. Relationship Between Age, High School Graduation, Professional Seniority, Year of Receiving Simulation Training And Knowledge Level About Wide QRS Complex Tachycardia

practice with increasing age. When the knowledge levels of the paramedics were analyzed according to the professional seniority variable, it was seen that the mean score of the paramedics from the survey increased as the professional seniority increased. In the rhythm recognition study conducted by Hoyle et al. (8) with emergency medicine trainees, participants with higher professional seniority were more successful than those with lower seniority. It is thought that the higher success of paramedics aged 31 and over and paramedics with a working year of more than 10 years may be due to their professional seniority and related professional experience.

 In our study, the mean total scores of graduates of VHS participants were seen to be higher than graduates from other schools. Priority was given to those who had graduated from the emergency medical technician (EMT) department of VHSs until 2016 in transitioning to paramedic programs of universities. EMTs need to take courses on pre-hospital emergency health services during their high school education in terms of providing basic education for paramedic training. It is thought that this situation positively affects the knowledge level of paramedics originating from EMTs.

Sudden cardiac death is an important condition seen in one of every 3 patients. Fatal arrhythmias including VT, VF, and Torsades de Pointes (TdP) are responsible for 80-85% of these deaths. In the studies of Efil and Türen (9) and Crocetti and Thompson (10), it was reported that incorrectly

Questions about diagnosis and treatment of wide QRS complex tachycardias	Correct n(%)	Incorrect n(%)
Definition of tachycardia	109 (77.9)	31 (22.1)
Duration of QRS on normal ECG	72 (51.4)	68 (48.6)
Recognition of VT	90 (64.3)	50 (35.7)
Treatment of pVT	96 (68.6)	44 (31.4)
Treatment of stable VT	87 (62.1)	53 (37.9)
Treatment of unstable VT	61 (43.6)	79 (56.4)
Recognition of WPW	28 (20)	112 (80)
Recognition of aberrant conduction SVT	84 (60)	56 (40)
Treatment of aberrant conduction stable SVT	80 (57.1)	60 (42.9)
Treatment of aberrant conduction unstable SVT	50 (35.7)	90 (64.3)
Recognition of TdP	107 (76.4)	33 (23.6)
Treatment of pulseless TdP	74 (52.9)	66 (47.1)
Treatment of unstable VT	90 (64.3)	50 (35.7)

Table 3. Answers Of Paramedics to The Questions About Diagnosis And Treatment Of Wide QRS Complex Tachycardias

interpreted ECGs at the emergency unit could lead to clinically important side effects. Therefore, paramedics working in pre-hospital emergency health services should have information about recognizing the ECG findings of arrhythmia and applying antiarrhythmics and electrical treatments. The fact that 22.1% of the paramedics did not know the definition of tachycardia and 48.6% did not know the normal duration of the QRS complex suggests the lack of information based on the ECG and the time calculation on the ECG paper. In the study of Özışık et al. (11) conducted with EMTs and paramedics, 31.2% of paramedics answered the question about the ECG paper incorrectly. When the results of the study were examined, it was seen that most of the paramedics had given wrong answers to the questions in which their basic ECG knowledge levels were questioned. In a study conducted by Zhang and Hsu (12) with nurses, the authors investigated the effect of ECG training on ECG interpretation knowledge and stated that increasing the level of ECG knowledge depended on continuous learning and practical applications.

In the literature, 99.8% of paramedics diagnosed VT in the study of McManus et al. (13), 95.9% in the study of Hale et al. (14), and 77% in the study of Jablonover et al. (15). In our study, 64.3% of the participants were found to diagnose the VT rhythm and this difference has been suggested to result

from the longer training duration of paramedics in other countries and the different education and experiences.

In our study, 68.6% of the participants knew that defibrillation is required in the treatment of pulseless ventricular tachycardia (pVT) and the proper energy level. In the study of Akıllı et al. (16), 67.2% of the participants were seen to recognize the shockable rhythm and applied defibrillation at the correct rhythm, while 32.8% did not recognize the shockable rhythm. In the study of Passali et al. (17) evaluating the knowledge and experience of nurses and physicians on basic and advanced life support, it was stated that approximately 68% of the participants knew the shockable rhythm requiring defibrillation and 48% knew the appropriate energy level for defibrillation. In our study, the rate of those who know that defibrillation would be performed in the case of pVT and the correct energy level was similar to other studies in the literature.

Paramedics participating in the study were asked about the treatment of stable VT, of which the parameters of consciousness, blood pressure, and pulse were given. While the rate of those who knew that stable VT would be treated with amiodarone 300 milligram IV was 62.1%, the rate of those who gave the wrong answer to this question was 37.9%. In the study of Fischer et al. (18), which compared the theoretical knowledge of physicians working in the pre-hospital services according to their previous training, the rate of participants who knew the treatment of stable VT was 62.9%.

In our study, there were two different questions about the treatment of unstable VT; in the first question, consciousness, pulse, and blood pressure parameters were given as unstable together with ECG image of VT and 43.6% of the participants gave a correct answer to this question. In the second question, a different ECG image of VT was given and vital parameters were not given as instability criteria, and the treatment of a patient who was unconscious and pulse could be obtained was asked.. Of the participants, 64.3% were seen to answer this question correctly. Although the correct answers to the questions were the same, the rate of giving the correct answer to the question without vital parameters was higher. It is thought that the different instability criteria given in both questions were not fully known and that the use of different VT samples caused this situation.

The participants were given the image of Wolff Parkinson White (WPW), a rhythm with a wide QRS complex included in the knowledge level questionnaire, and asked what the rhythm was. Only 20% of the participants could recognize the WPW rhythm. WPW rhythm was the most incorrectly answered rhythm in our study. In the rhythm recognition study conducted by Hale et al. (14) conducted with paramedics, 49% of the participants recognized WPW. In the rhythm recognition study conducted by Jablonover et al.

(15), 25% of the participants recognized WPW. In the study conducted by Hoyle et al. (8), 24% of the participants recognized WPW. In the rhythm recognition study conducted by Snyder et al. (19) with pediatric residents and interns, it was determined that one of the most frequently mistaken rhythms was WPW. As in other studies, the rate of awareness of WPW in our study was quite low. This may be because WPW is less common in the pre-hospital setting than other arrhythmias.

The TdP image in the knowledge level questionnaire was given to the paramedics participating in the study and they were asked what the rhythm was. It was observed that 76.4% of the participants recognized the TdP rhythm. When asked about the procedure to be performed in the patient who was unconscious and had no pulse in the treatment of TdP, 52.9% of the participants knew the defibrillation and energy level. In the rhythm recognition study conducted by Jablonover et al. (15), 82% of the participants recognized TdP. The fact that TdP has an easy-to-remember and unique appearance was thought to have contributed to its higher recognition rate compared to other rhythms in our study.

The participants were asked about SVT with aberrant conduction, which creates a wide QRS complex and 60% of them recognized SVT with aberrant conduction and 40% answered it incorrectly. In the rhythm recognition study of Mencl et al. (20) conducted with paramedics, 65.3% of the participants recognized SVT. In the study of Morrison et al. (21) conducted with paramedics, investigating the reversal of paroxysmal SVT with adenosine treatment, the recognition rate of paramedics varied between 79% and 95%. In the study of Goebel et al. (22) evaluating paroxysmal SVT diagnosed by paramedics out of the hospital between 1993 and 2002, the recognition rate was found to vary between 59% and 95%. When the study questions were analyzed, the results of our study were found to be consistent with the literature. In another question, the participants were asked about the treatment of stable SVT with aberrant conduction, which creates a wide QRS complex. While the rate of those who knew that the treatment of stable SVT with aberrant conduction, which creates a wide QRS complex, would be done with adenosine, as in narrow regular SVT, was 57.1%, the rate of those who answered this question incorrectly was 42.9%. In a study by Brady et al. (23), the effectiveness of adenosine and verapamil treatment was evaluated in patients diagnosed with pre-hospital SVT. It was stated that 33% of the patients diagnosed with SVT had a rhythm recognition error, and adenosine was administered to patients with sinus tachycardia other than SVT and patients with different arrhythmias such as atrial fibrillation (AF), and none of these patients returned to sinus rhythm. In the study of Goebel et al. (22), it was observed that 5.4% of the rhythms treated inappropriately with adenosine were regular wide QRS

tachycardias, and in the 10-year period, inappropriate adenosine use was detected in 20% of the patients due to misdiagnosis of PSVT. In a study by McCabe et al. (24), the clinical efficacy and safety of intravenous (IV) adenosine administration in the treatment of PSVT was evaluated, and it was observed that rhythm was misdiagnosed in 30% of the patients with a diagnosis of SVT. Adenosine treatment was administered in patients with the diagnoses of arrhythmias other than SVT and side effects developed due to incorrect treatment. In the study of Haynes (25), 2 deaths were reported due to inappropriate use of adenosine due to confusion of AF with PSVT.

Another parameter investigated in our study was the treatment of an unstable SVT with aberrant conduction that produced a wide QRS complex. It was observed that 35.7% of the participants knew the cardioversion and energy level correctly, while 64.3% did not know the treatment to be applied in unstable SVT. In the simulation study by Khalil et al. (26) with the heading of the performance of emergency healthcare personnel in unstable SVT in pediatric and adult patients, it was observed that the participants included in the adult simulation recognized the signs of instability in an average of 40 seconds, and 50% of them knew the appropriate energy level for cardioversion. In the study of Goebel et al. (22), it was reported that paramedics were given training on the diagnosis and treatment of tachyarrhythmias, and rhythm recognition error and inappropriate use of adenosine were the lowest in the 10-year period in which the training was given. In the study of Lee et al. (27) which compared traditional advanced life support course teaching and scenario-based performance-based team training method, the scenario-based training group was found to be more successful in rhythm recognition than the traditional training group, and it was stated that a performance-oriented approach in advanced life support training may be a suitable option for university students. In the study of Kara et al. (28) conducted with 451 participants, the importance of update of theoretical knowledge, feedback, simulation training, frequent practice-oriented training, and certification was emphasized.

Limitations

The main limitation of this study was the small sample size and representing only one region in Turkey. It is thought that the results do not represent the general population since the non-probabilistic simple sampling method was used in the study. It is also possible that we had a selection bias when choosing ECGs that were particularly difficult to interpret.

Conclusion

The most important factors in the correct diagnosis and treatment of wide QRS complex tachycardias by paramedics working in the pre-hospital area include age, professional

seniority, type of high school graduation from, and scenario-based simulation training. The fact that 22.1% of the participants did not know the basic information such as the definition of tachycardia and 48.6% of the participants did not know the QRS duration in a normal ECG shows that these rates were quite high in our study, which was conducted with a limited sample of 140 people. Furthermore, the accuracy level for the diagnosis and treatment of some critical arrhythmias such as unstable VT is very low. We also found that the knowledge level of paramedics on the diagnosis and treatment of wide QRS complex tachycardias was lower than expected.

We consider that reinforcing subjects such as basic ECG, anti-arrhythmic drug use, management of arrhythmias, and electrical therapy with scenario-based applications will contribute to the paramedics being better equipped both theoretically and practically during their university education and post-graduation.

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