The Level of Knowledge of Pediatricians on Defibrillation

Çocuk Doktorlarının Defibrilasyon Hakkındaki Bilgi Düzeyleri

Halise AKÇA[1], Nilden TUYGUN[2], Can Demir KARACAN[1]

[1]Ankara Yıldırım Beyazıt University, Faculty of Medicine, Department of Pediatric Emergency Medicine, Ankara, Turkey
[2]Dr. Sami Ulus Maternity and Children Health and Diseases Training and Research Hospital, Pediatric Emergency Clinic, Ankara, Turkey

ABSTRACT

Objective: Defibrillation is part of the life-saving chain. Our aim in this study was to evaluate the level of knowledge of pediatricians on defibrillation procedures.

Material and Methods: The questionnaire was administered to 308 pediatricians. The specialists were grouped according to their experience as under 5 years, 5-10 years and over 10 years while the research assistants were classified as 1st year, 2nd year, 3rd year and 4th year. Subjects with 0-2 correct answers were classified as less knowledgeable, 3-5 as moderately knowledgeable and 6-8 as knowledgeable.

Results: A small percentage of the physicians had received training on the defibrillation procedure. The self-sufficiency rate for the use of the defibrillator device was around 50% in those who received training and around 20% among all physicians. The mean number of correct answers given to the 8 questions used to evaluate the level of knowledge was 4.36±1.77. Approximately half of the subjects (51%) had a moderate level of knowledge. The level of knowledge of the pediatricians who examined patients, had been trained on defibrillator use and used one themselves was significantly higher. The number of correct answers increased as the subject's self-assessment of his/her adequacy increased. There was a significant difference between the level of knowledge of specialists with less than and over 10 years of experience.

Conclusion: We found that pediatricians participating in our study did not have adequate defibrillation knowledge. We believe that updating defibrillator device training and increasing the relevant self-confidence before the level of knowledge decreases is very important.

Key Words: Cardiac arrest, Cardiopulmonary resuscitation, Electroversion therapy, Knowledge, Pediatricians

ÖZ

Amaç: Defibrilasyon hayat kurtarma zincirinin bir parçasıdır. Bu çalışmada defibrilasyon uygulamaları hakkında çocuk doktorlarının bilgi düzeylerinin değerlendirilmesi amaçlanmıştır.

Gereç ve Yöntemler: Anket formu 308 çocuk doktoruna uygulandı. Çalışma sürelerine göre uzmanlar 5 yılın altında, 5-10 yıl arası ve 10 yılın üzerinde olarak gruplandı, araştırma görevlileri çalışma süresi 1. yıl, 2. yıl, 3. yıl ve 4. yıl olarak tanımlandı. Doğru cevap sayısı 0-2 arasında olanlar az düzeyde bilgili, 3-5 arasında olanlar orta düzeyde bilgili, 6-8 arasında olanlar iyi düzeyde bilgili olarak yorumlandı.

Bulgular: Doktorların az bir kısmı defibrilasyon işlemi hakkında eğitim almıştı. Defibrilatör cihazının kullanımı konusunda kendini yeterli görme oranı eğitim alanlarda yaklaşık %50 iken, tüm doktorlar arasında %20 civarındaydı. Bilgi düzeyinin sorgulandığı 8 soruya verilen doğru cevapların ortalaması 4.36±1.77 bulundu. Katılımcıların yaklaşık yarısı (%51) orta düzeyde bilgiliydi. Defibrilatör eğitimi alan, hasta gören ve kendisi kullananların bilgi düzeyi anlamlı derecede yüksekti. Defibrilatör konusunda kendini yeterli görme oranı arttıkça sorulara doğru yanıt verme oranı artıyordu. Çalışma yılı 10 yılın altında ve üstünde olan uzmanlar arasında bilgi düzeyi farkı anlamlıydı.

Sonuç: Çalışmamıza katılan çocuk doktorlarının defibrilasyon konusunda yeterli bilgiye sahip olmadığı gösterilmiştir. Defibrilatör cihazlarıyla ilgili eğitimlerin bilgi düzeyi azalmadan güncellenmesinin ve özgüvenin arttırılmasının önemli olduğunu düşünmekteyiz.

Anahtar Kelimeler: Kardiyak arrest, Kardiyopulmoner resüsitasyon, Defibrilasyon, Bilgi düzeyi, Çocuk doktoru

Correspondence Address:/ Yazışma Adresi:
Halise AKÇA
Ankara Yıldırım Beyazıt University, Faculty of Medicine,
Department of Pediatric Emergency Medicine, Ankara, Turkey
E-posta: haliseakca@gmail.com

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INTRODUCTION

Defibrillation and cardioversion procedures consist of administering a therapeutic dose of electrical energy delivered to the heart with a device called a defibrillator. Defibrillation is a treatment option proven to improve survival in the treatment of life-threatening cardiac arrhythmias such as ventricular fibrillation and pulseless ventricular tachycardia. Portable automatic external defibrillator (AED) devices have been developed so that non-health care professionals can use defibrillator devices effectively and provide early intervention. Information about the heart rhythm and what the user should do is provided by the AED device in writing on the monitor and/or by voice. Manual defibrillator devices are used by a physician or assistant healthcare staff as the heart rhythm must be recognized and the energy dose selected. Both manual defibrillation and AED procedures can be performed with the newer defibrillator devices. Proper and correct use of defibrillator devices is very important for a successful procedure.

Early cardiopulmonary resuscitation and AED implementation have been shown to increase 30-day survival and improve neurological results in case of out-of-hospital cardiac arrest in children (1). The International Liaison Committee on Resuscitation (ILCOR) recommends the use of AED for cardiopulmonary arrest in children aged one year or older. All health care employees are required to perform all standard resuscitation steps including the use of AED in resuscitation treatment algorithms (2, 3). Childhood cardiac arrest usually presents with asystole due to respiratory failure. The use of defibrillation is therefore only rarely required in the pediatric age group (4). When non-hospital cardiac arrest subjects were classified as 1-8 years (children), 9-17 years (adolescents) and adults according to age group in a study, it was shown that the rates of a shockable rhythm and the need for AED were significantly lower in the pediatric age group but were similar in adolescents and adults (5). Lack of knowledge and experience on defibrillator use due to lack of practice has also been reported among healthcare employees (6).

The aim of this study was to evaluate the levels of knowledge and awareness of pediatricians about defibrillation procedures.

MATERIALS and METHODS

The study was a cross-sectional descriptive study. Individuals working in hospitals providing tertiary healthcare in the Ankara province center, accepted to participate in the study, and were pediatric specialists and/or research assistants were included in the study. Those who did not accept to participate in the study and physicians working in different provinces were not included. The participants were informed that the data would be used for research purposes. Approval for the study was obtained from the Clinical Trials Ethics Committee.

The number of physicians who accepted to participate in the study was 308. The specialists were grouped according to their experience as under 5 years, 5-10 years and above 10 years. Since the specialization training takes 4 years in our country, the experience of the research assistants was identified as 1st year, 2nd year, 3rd year and 4th year.

The questionnaire form designed by the person conducting the study was completed by a face-to-face interview. The questionnaire used consisted of 16 multiple choice questions. The first 8 questions were on the demographic and educational background and experience of the participants while the other questions queried their knowledge on defibrillation. The numbers of correct answers were classified as follows: 0-2 less knowledgeable, 3-5 moderately knowledgeable, 6-8 knowledgeable. The results of the questionnaire were not shared with the participants.

Statistical analysis

The SPSS (Statistical Package for Social Sciences Inc., Chicago, IL, USA) for Windows 20.0 software program was used for the statistical analyses. The descriptive statistics were provided as mean and standard deviation or frequency. A p value <0.05 was accepted as significant. The Chi square test was used to compare groups.

RESULTS

The physicians who participated in the study consisted of 201 research assistants and 107 specialists (Table I).

Only 20% of all physicians felt adequate regarding defibrillator use. The adequacy rate was similar among the specialists with various degrees of experience and increased in the 4th years among the research assistants (Table II). Only half of those who received defibrillator training considered themselves adequate regarding defibrillation administration.

The percentage of physicians who reported receiving training with a defibrillator is small (manual defibrillator 23%, AED 9%). The rate of seeing a patient requiring defibrillation was 70%, the

Table I: Distribution of participants by working years.

	Working time, year	Number (n)	Percent (%*)
Research assistants	1 year	59	19.2
	2 year	58	18.9
	3 year	42	13.6
	4 year	42	13.6
Specialists	<5 year	32	10.4
	5-10 year	33	10.7
	>10 year	42	13.6

Table II: Participants' adequacy rates on defibrillator use.

	Working time, year	Insufficient n (%*)	Neutral n (%*)	Adenquate n (%*)
Research assistants	1 year	38 (64.4%)	15 (25.4%)	6 (10.2%)
	2 year	36 (62.0%)	15 (25.9%)	7 (12.1%)
	3 year	34 (81.0%)	4 (9.5%)	4 (9.5%)
	4 year	15 (35.7%)	12 (28.6%)	15 (35.7%)
	Total	123 (61.2%)	46 (22.9%)	32 (15.9%)
Specialists	<5 year	12 (37.5%)	12 (37.5%)	8 (25.0%)
	5-10 year	12 (36.4%)	12 (36.4%)	9 (27.2%)
	>10 year	18 (42.8%)	12 (28.6%)	12 (28.6%)
	Total	42 (39.3%)	36 (33.6%)	29 (27.1%)
All participants		165 (53.6%)	82 (26.6%)	61 (19.8%)

***:** *Percentages as a percentage of the line*

Table III: Comparison of correct answers according to years of work.

	Research assistants (%)					Specialists (%)				p
	1. year	2. year	3. year	4. year	p	<5 year	5-10 year	>10 year	p	
Are defibrillator devices different for children and adults? (No)	42.4	48.3	66.7	66.7	0.025	56.3	72.7	73.8	0.223	0.018
When is the sync button on the defibrillator used? (Cardioversion)	81.4	75.9	85.7	81.0	0.670	87.5	78.8	66.7	0.106	0.415
Where is the charging button located on the defibrillator? (On monitor and / or right spoon)	50.8	63.8	57.1	59.9	0.558	68.8	78.8	52.4	0.053	0.189
How to place defibrillator spoons? (Anterolateral and / or anteroposterior)	64.4	69.0	69.0	69.0	0.940	68.8	69.7	64.3	0.866	0.947
Which gel or substance is suitable for the defibrillator? (Special gel)	32.2	37.9	28.6	45.2	0.390	46.9	36.4	40.5	0.689	0.361
How many joules/kg is the first cardioversion dose? (0.5-1 joules/kg)	35.6	58.6	64.3	76.2	0.000	68.8	81.8	57.1	0.076	0.049
How many joules/kg is the first defibrillation dose? (2 joules/kg)	40.7	50.0	64.3	78.6	0.001	71.9	81.8	54.8	0.040	0.041
How many joules are applied to the AED? (50-75 joules)	3.4	12.1	14.3	2.4	0.070	12.5	24.2	14.3	0.387	0.018

rate of defibrillator use was 40%, the rate of observing AED use was 7% and the rate of AED use was 2%.

Table III presents the number of correct answers by years of experience. Nearly half of the physicians (40.9%) thought that defibrillator devices for children and adults were different and therefore had no idea about the different paddle sizes. Only a third (37.7%) knew that a special gel would be used in the defibrillation procedure and most of them thought that ultrasound gel, water or alcohol could be used. The rate of correct answers for choosing the energy dose increased with the training year of research assistants ($p<0.05$).

The mean number of correct answers was 4.36 ±1.77 (min: 0, max: 8). About half the participants (51%) were moderately knowledgeable (correct answer to 3-5 questions). As expected, the level of knowledge of specialists was higher than research assistants. There was no difference in the level of knowledge between specialists with less and more than 5 years of experience while a significant difference was present between those with less and more than 10 years of experience ($p=0.023$). There was also an increased rate of correct answers as the subjects thought of themselves as more adequate regarding defibrillators ($p<0.1$). The level of knowledge of the pediatricians who examined patients and used a defibrillator themselves was significantly higher. Although those who had received AED training were more knowledgeable than those that had not, the rates of examining a relevant patient and using a defibrillator were low in this group (Table IV).

Table IV: Comparison of knowledge levels

		Less knowledgeable, n (%)	Moderately knowledgeable, n (%)	Knowledgeable, n (%)	p
Research assistants / Specialists	Research assistants Specialists	41 (20.4) 15 (14.0)	109 (54.2) 48 (44.9)	51 (25.4) 44 (41.1)	0.006
Work year, Specialists	<5 year 5-10 year >10 year	2 (6.2) 3 (9.1) 10 (23.8)	17 (53.1) 12 (36.4) 19 (45.2)	13 (40.6) 18 (54.5) 13 (31.0)	0.056
How do you define yourself about defibrillator use?	Insufficient Neutral Sufficient	37 (22.4) 14 (17.1) 5 (8.2)	95 (57.6) 41 (50.0) 21 (34.4)	33 (20.0) 27 (32.9) 35 (57.4)	0.000
Have you received training on defibrillator use?	No Yes	49 (20.7) 7 (9.8)	127 (53.6) 30 (42.3)	61 (25.7) 34 (47.9)	0.000
Did you see the patient who needed to use defibrillators?	No Yes	21 (22.3) 35 (16.4)	55 (58.5) 102 (47.6)	18 (19.2) 77 (36.0)	0.006
Did you use the defibrillator in the patient who needed it?	No Yes	39 (21.3) 17 (13.6)	96 (52.5) 61 (48.8)	48 (26.2) 47 (37.6)	0.017
Have you received training on the use of AED?	No Yes	55 (19.6) 1 (3.7)	145 (51.6) 12 (44.4)	81 (28.8) 14 (51.9)	0.005
Have you seen patients who need to use AED?	No Yes	53 (18.5) 3 (14.3)	145 (50.5) 12 (57.1)	89 (31.0) 6 (28.6)	0.940
Did you use the AED in the patient who needed it?	No Yes	56 (18.5) 0 (0.0)	152 (50.3) 5 (83.3)	94 (31.1) 1 (16.7)	0.964

DISCUSSION

We evaluated the level of knowledge and awareness of the pediatricians regarding defibrillation use in this study. The level of knowledge was shown to increase with training and experience but to decrease over time. AED experience was found not to have an effect on the level of knowledge. This can be explained by the rare need for an AED and the subject group characteristics.

A study conducted on the effective energy to use for defibrillation reported that high doses could be used in animal models, but the decision needed to be made according to age and weight in humans. Clinicians were recommended to follow regional consensus reports and guidelines since there was no relationship between the initial defibrillation energy and the recovery of spontaneous circulation and survival (7). The initial energy used in our study was 2 J/kg in accordance with the ILCOR guidelines. Lack of information on defibrillator paddle selection and placement has been demonstrated in a study on emergency medical care providers (8). The rate of correct answers to the question on the paddle placement site (anterolateral and/or anteroposterior) was around 60-65% with no difference between the research assistants and the specialists in our study. On the other hand, the correct answer rate regarding spoon placement increased depending on the training year of the research assistants and the experience of the specialists.

Ammirati et al. found that subjects did not prefer to use the AED even when it was next to the phone in the room with a cardiac arrest model (9). Another study found that only 2% of public rescuers were trained on accessing and using an AED when they encountered a cardiac arrest (10). A study on non-medical participants has reported that the level of knowledge was around 31% even in the group that had received theoretical training on basic life support and AED (11). Despite the general emphasis on the importance of resuscitation, the level of knowledge and awareness about AED use has been found to be insufficient (10, 12). The survival rate of out-of-hospital cardiac arrests varies by region worldwide. A meta-analysis of 67 studies including subjects in all age groups found the survival rate to be lowest in Asia at 2% while it was 6% in North America, 9% in Europe, and 11% in Australia (13). The out-of-hospital cardiac arrest survival rate was 14.3% and a shockable rhythm was detected in only 4 of 182 patients at the time of diagnosis in a study conducted in the pediatric age group in our country (14). Low survival rates can be explained by the lack of training and awareness of non-hospital staff and the difficulty of accessing AED devices. The ratio of AED training and awareness among pediatricians was low in our study. This inadequate awareness of AED can be explained by the low incidence of shockable rhythms in pediatric patients.

Many studies have reported that medical students, assistant healthcare staff and people who are not healthcare employees can successfully use defibrillators after training (15-17). Pharmacy students were able to use the device instantly after receiving AED training and also succeeded in their attempts after 4 months (18). Another study has reported that people who were healthcare employees could use an AED reliably but the performance was better after training (19). The individuals who received training were found to consider themselves to be significantly more adequate and answer the questions correctly in our study.

The level of knowledge has been shown to increase immediately after training but then decrease significantly after 6 months in studies conducted on the level of knowledge on basic life support and external defibrillation (8, 20). The incorrect answer rate was also shown to be significantly increased and the level of knowledge to be decreased after 10 years of experience in the specialist physicians in our study. It is recommended to update information every 5-10 years, before it is deleted.

CONCLUSIONS

Our data show that pediatricians do not have sufficient knowledge on defibrillation. We believe that it is very important to update training on defibrillator devices to be used in emergency situations, when there is little time for decision-making and interpretation, both to avoid a decreased level of knowledge and to increase self-confidence.

Compliance with Ethical Standards:

Conflict of Interest: On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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