ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA MAKALESİ

Evaluation of Pediatric Cases with Suspected Rabies Exposure in the Pediatric Emergency Department

Çocuk Acil Servise Kuduz Şüpheli Hayvan Teması İle Başvuran Pediatrik Olguların Değerlendirilmesi

Yalçın Kara[1], Mahmut Can Kızıl[1], Ömer Kılıç[1], Sabiha Şahin[2], Ener Çağrı Dinleyici[3]

ABSTRACT

Aim: Rabies is a public health problem that can be prevented by vaccination and prophylaxis practices both in our country and in the world. It has a high risk of death if it cannot be prevented. In this study, we aimed to investigate the clinical and epidemiological characteristics of children admitted to the pediatric emergency department of our hospital with the suspicion of rabies.

Material and Methods: In this study, patients who applied to the Pediatric Emergency Department of Eskişehir Osmangazi University Faculty of Medicine between January 2013 and June 2021 with contact with an animal with an animal at risk of rabies were evaluated retrospectively. Epidemiological and clinical features of 746 pediatric cases included in the study were evaluated.

Results: 55% of 746 patients included in the study were male and the mean age was 102 months (4 months-216 months). 94% of the cases reside in the city and 6% reside in the countryside. There was cat contact in 54% and dog contact in 46% of the cases. Of the contact animals, 84% were stray and 89% were unvaccinated. While 82% of suspected rabies contacts were in category 2, 60% had upper extremity contact, and 21% had lower extremity contact. While wound cleaning was performed in all cases, rabies vaccine was administered to 99%, rabies immunoglobulin to 10%, tetanus prophylaxis to 32%, and antibiotic treatment to 21%. Immunoglobulin, antibiotics, tetanus prophylaxis, suturing and hospitalization were higher in the dog contact group than in the cat contact group. Compliance with the rabies vaccination schedule was high in both groups.

Conclusion: Our study shows that the contact cases with suspected rabies are mostly with stray and unvaccinated animals, and precautions such as vaccination and housing of stray animals should be increased. Rabies, which is still a deadly public health problem for the whole world and for our country, can be prevented by vaccination, post-exposure prophylaxis practices, and community education.

Keywords: Acute gastroenteritis, inferior vena cava collapsibility index, pediatrics

ÖZ

Amaç: Kuduz hem ülkemizde hem de dünyada aşı ve profilaksi uygulamaları ile önlenebilen, önlenemediği takdirde ölüm riski yüksek bir halk sağlığı sorunudur. Bu çalışmada hastanemiz çocuk acil servisine kuduz teması şüphesiyle başvuran çocukların klinik ve epidemiyolojik özelliklerini araştırmayı amaçladık.

Gereç ve Yöntemler: Çalışmamızda Ocak 2013-Haziran 2021 tarihleri arasında Eskişehir Osmangazi Üniversitesi Tıp Fakültesi Çocuk Acil Servisi'ne kuduz riski taşıyan bir hayvanla temas ile başvuran çocuk hastalar retrospektif olarak değerlendirildi. Çalışmaya dahil edilen 746 pediatrik olgunun epidemiyolojik ve klinik özellikleri değerlendirildi.

Bulgular: Çalışmaya alınan 746 olgunun %55'i erkekti ve yaş ortalaması 102 ay (4 ay-216 ay) idi. Vakaların %94'ü şehirde, %6'sı kırsalda ikamet etmektedir. Vakaların %54'ünde kedi, %46'sında köpek teması vardı. Temaslı hayvanların %84'ü sahipsizdi ve %89'u aşısızdı. Şüpheli kuduz temaslılarının %82'si kategori-2'de iken, %60'ında üst ekstremite teması ve %21'inde alt ekstremite teması vardı. Tüm olgularda yara temizliği yapılırken, %99'una kuduz aşısı, %10'una kuduz immünoglobulin, %32'sine tetanoz profilaksisi ve %21'ine antibiyotik tedavisi uygulandı. İmmünoglobulin, antibiyotik, tetanoz profilaksisi, dikiş atma ve hastaneye yatış, köpek temas grubunda kedi temas grubuna göre daha yüksekti. Her iki grupta da kuduz aşı takvimine uyum yüksekti.

Sonuç: Çalışmamız, kuduz şüphesi olan temas vakalarının çoğunlukla sahipsiz ve aşısız hayvanlarla olması, sokak hayvanlarının aşılanması ve barındırılması gibi önlemlerin artırılması gerektiğini göstermektedir. Tüm dünya ve ülkemiz için halen ölümcül bir halk sağlığı sorunu olan kuduz, aşılama, temas sonrası korunma uygulamaları ve toplum eğitimi ile önlenebilir.

Anahtar Kelimeler: Akut gastroenterit, inferior vena cava kollapsibilite indeksi, pediyatri

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[1] Eskişehir Osmangazi University Faculty of Medicine, Department of Pediatrics, Division of Pediatric Infectious Diseases, Eskişehir, Turkiye

[2] Eskişehir Osmangazi University Faculty of Medicine, Department of Pediatrics, Division of Pediatric Emergency Care, Eskişehir, Turkiye

[3] Eskişehir Osmangazi University Faculty of Medicine, Department of Pediatrics, Division of Pediatric Intensive Care, Eskişehir, Turkiye

Corresponding Author: Yalcin Kara, MD ***Address:*** Eskişehir Osmangazi University Faculty of Medicine, Department of Pediatrics, Division of Pediatric Infectious Diseases, Eskişehir, Turkiye ***Phone:*** +905058434397 ***E-mail:*** dryalcinkara@hotmail.com

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Introduction

Rabies is acute, progressive encephalitis caused by the *Lyssavirus* of the *Rhabdoviridae* family. Rabies is a disease that does not have an effective treatment after its clinical manifestations start to be seen (1). And results in the highest death rate among infectious diseases, but is preventable by immunization. It is one of the important causes of death especially in underdeveloped and developing countries. The most common cause of rabies in the world is pets, and dogs are the most common among them (2). Apart from dogs, rabies transmission is also possible from pets such as cats, cattle, sheep, goats, horses, donkeys, and wild animals such as wolves, foxes, jackals, pigs, bears, martens, skunks, and weasels. Animals are not equally susceptible to the rabies virus. Wolf, fox, and coyote contact is the highest risk, while dog contact is considered a medium risk for rabies, but also is the most common cause of transmission in developing countries. Contacts with mice, rats, squirrels, hamsters, guinea pigs, gerbils, rabbits, and hares have not been shown to transmit rabies and do not need post-exposure prophylaxis (3).

Rabies is a global public health problem with a high mortality rate and social impacts, as well as a significant socio-economic burden. It is recognized as a neglected disease worldwide by the World Health Organization (WHO). According to WHO data, 59,000 people die every year in more than 150 countries due to rabies. 59% of these deaths occur in Asia, and 36% in Africa, and it is seen that children under the age of 15 account for approximately half of these deaths. An estimated 35,000 people die each year in Asia due to canine-mediated rabies, with India taking the lead. Turkey is still an endemic region for rabies (4). In Turkey, approximately 180,000 risky rabies contact reports are made annually and most of these cases are included in the vaccination program to prevent rabies, but an average of 1-2 rabies cases are seen per year. Throughout the world, dogs are responsible for 92%, cats 2%, other pets 3%, bats 2%, and other wild animals less than 1%. It is seen that 93% of rabid animals in our country are pets and among them dogs take the first place with 59%. According to the data from the Turkish Government Ministry of Health, 15 rabies cases occurred in Turkey in the 10 years between 2008-2017. The clinical course of the disease is incubation period, prodrome period, acute neurological period, coma, and death (3,5-7). Prophylaxis applied in contact with suspected rabies animals in our country is carried out within the framework of the principles specified in the Rabies Prophylaxis Guide updated in 2019 by the Republic of Turkey Ministry of Health General Directorate of Public Health. It is mainly divided into two as pre-exposure protection and post-exposure prophylaxis (3). The contact with suspected rabid animals is divided into 4 categories in the guideline according to the nature of the contact and prophylaxis is planned according to these categories (Table 1). Postexposure prophylaxis is an emergency medical intervention and should be done as soon as possible. Wound care includes active immunization with rabies vaccine and passive immunization with rabies immunoglobulin. After contact with rabies risk, rabies protection can be provided at rates close to 100% with a timely and correct application. The primary step in contact with a suspected rabid animal is wound care. The wound site should be washed with plenty of soapy water and povidone-iodine can be applied. Rabies vaccination and rabies immunoglobulin form the basis of post-exposure prophylaxis (8-10).

Anyone admitted with rabies risky contact should also be evaluated for tetanus prophylaxis and antibiotic prophylaxis against potential wound pathogens (3). In addition, all applications should be evaluated in terms of tetanus vaccine, tetanus immunoglobulin and antibiotic prophylaxis according to wound site and vaccination status (Table-2) (11). For the prevention of rabies cases, the correct administration and knowledge of the approach to rabies risky contact cases are essential for all healthcare professionals. In this study, we aimed to retrospectively evaluate the general characteristics and prophylaxis approaches of pediatric patients who applied to the emergency department of our hospital with rabies risky contact.

Material and Methods

In our study, pediatric patients who were admitted to Eskişehir Osmangazi University Faculty of Medicine Pediatric Emergency Department between January 2013 and June 2021 with contact with animals at risk for rabies were evaluated retrospectively. The study was started after the approval of Eskişehir Osmangazi University Ethics Committee (Date:28.09.2021 Number:06). Patient data were obtained from the hospital information management system. 1059 rabies risky animal contact pediatric cases were identified, and the information of 746 of these patients was fully accessed. Patients over the age of 18 and cases with missing data entry were not included in the study. Among the cases included in the study, parameters such as age, sex, date, location, type of animal, vaccination status, category of contact, anatomical location, wound cleaning performed in post-exposure prophylaxis, antibiotherapy, vaccine, immunoglobulin and tetanus prophylaxis administration, side effects, treatment compliance were investigated. The classification and post-exposure prophylaxis practices of the cases included in the study were organized within the framework of the principles specified in the Rabies Prophylaxis Guide updated in 2019 by the World Health Organization (WHO) and the Republic of Turkey Ministry of

Health, General Directorate of Public Health. Rabies risky contact cases were divided into 4 categories according to the nature of the contact animal and the wound site (Table 1). Post-exposure vaccination is were divided into 3 groups as 4-dose vaccination schedule (0, 3, 7, 14-28), 5-dose vaccination schedule (0, 3, 7, 14, 28), and 3-dose vaccine scheme (in animals with owners, 0, 3, 7). Tetanus prophylaxis approach was classified according to tetanus vaccine and tetanus immunoglobulin administration, previous tetanus vaccination status, and the characteristics of the wound site (Table 2).

Statistical analysis

While evaluating the findings obtained in this study, SPSS (Statistical Package for Social Sciences) 21.0 for Windows program was used for statistical analysis. While evaluating the study data, Pearson Chi-Square test was used to compare qualitative data, and T test was used to evaluate single samples and independent samples. While descriptive data were expressed with frequency and percentage (%), a value of $p<0.05$ was considered statistically significant.

Results

In our study, 1059 pediatric patients who were admitted to Eskişehir Osmangazi University Faculty of Medicine Pediatric Emergency Service between January 2013 and June 2021 with risky animal contact for rabies were included. The data of 194 of these 1059 cases could not be accessed from the hospital automation system. Out of 865 cases whose data were accessed, 119 of them were excluded from the study because there was some missing data.

Of the 746 cases included in the study, 408 (55%) were male and 338 (45%) were female. The mean age was 102 months (4 months-216 months). Of the cases, 701 (94%) were urban and 45 (6%) resided in the countryside. Of 746 cases, 403 (54%) were contacted with cats and 343 (46%) were contacted with dogs. While 624 (84%) were stray, 122 (16%) were pets, 668 (89%) were not vaccinated against rabies, 78 (11%) were vaccinated. 612 (82%) of rabies suspected animal contacts were in category 2, 132 (7.8%) were in category 3, 2 (0.2%) were in category 1. There were upper extremity contact in 444 (60%) cases, lower extremity in 159 (21%), trunk in 38 (5%), face and head in 80 (%10), and multiple anatomical location contact in 25 (3.3%) cases. 43 (6%) of patients admitted in the first 1-7 days and only 1 patient admitted to hospital after 7 days. While rabies vaccine was administered to 745 (99%) suspected rabies contact cases (632 (85%) had 4 doses, 69 (9%) had 5 doses, 44 (6%) had 3 doses), 73 (10%) of them were given rabies immunoglobulin, 238 (32%) tetanus vaccine, 124 (17%) oral antibiotics, and 26 (3.4%) of them had parenteral antibiotics. In 4 cases (0.5%) some side effects (fever, vomiting, rash) developed after vaccination and immunoglobulin administration. While compliance with the vaccination schedule was 99%, 2 cases refused to be vaccinated. 41 (5%) patients were sutured and 23 (3%) were admitted to the inpatient service and followed up (Table 3).

1	-Touching/feeding the animal -Intact skin exposure to animal's saliva			No intervention warranted
2	-Slight scratching of skin (injuries not extending to subcutaneous tissue)	If the exposed animal was vaccinated within the last year		Wound care Evaluation for tetanus prophylaxis Observation of animal for 10 days
	-Minor injuries without bleeding	If the exposed animal was not vaccinated within the last year or vaccination status is unknown	If the animal is healthy and can be observed properly	Wound care Evaluation for tetanus prophylaxis Observation of animal for 10 days
			If the animal cannot be observed	Wound care Evaluation for tetanus prophylaxis Initiation of rabies vaccination
3	-Bites/scratches penetrating the skin	If the exposed animal was vaccinated within the last year		Wound care Evaluation for tetanus prophylaxis
	-Exposure of open wounds/mucosa to animal's saliva			Observation of animal for 10 days
	-Lesions localised to head, fingertips (areas of dense innervation)	If the exposed animal was not vaccinated within the last year or vaccination status is unknown	If the animal is healthy and can be observed properly	Wound care Ovaluation for tetanus prophylaxis Commencement of rabies vaccination Observation of animal for 10 days Administration of anti-rabies Ig
			If the animal cannot be observed	Wound care Ovaluation for tetanus prophylaxis Commencement of rabies vaccination Administration of anti-rabies Ig
4	Exposure to wild animals with a risk of rabies			Wound care Ovaluation for tetanus prophylaxis Commencement of rabies vaccination Administration of anti-rabies Ig5

Table 1: Categories of Rabies Risk Animal Exposures (T.R. Ministry of Health, National Rabies Field Guide)

History of Tetanus ımmunization	Category-2 Rabies Risk Animal Exposure[1]		Category-3,4 Rabies Risk Animal Exposure	
	Td	TIG	Td	TIG
Uncertain or < 3 doses	Yes	No	Yes	No
>3 doses	No/unless> 10 years since last dose	No	No/ unless > 5 years since last dose	No

Table 2. Indications for Tetanus Prophylaxis Rabies Risk Animal Exposure

The risk of rabies contact with a dog was more common in boys, and contact with a cat was more common in girls (p<0.001). Immunoglobulin, antibiotics, suturing administrations and hospitalization rates were higher in cases with rabies risky contact with dogs compared to contact with cats (p<0.001). Although the vaccination rate was higher in canine contact, there was no difference between the cats and dogs (p=0.05). Category 3 contact was higher in cases with dog contact (p<0.001). There was more lower extremity contact in cases contacted with dogs, and more upper extremity contact in cases contacted with cats (p<0.001).

	Total (n) (%)	Cat (403)	Dog (343)	P
Age (month)	102 (4-216)	92 (4-216)	113(6-216)	0,40
Boy	408 (54)	194 (49)	214 (62)	**<0,001**
Girl	338 (46)	209 (51)	129 (38)	
City	701 (93)	391 (97)	310 (90)	**<0,001**
Rural	45 (7)	12 (3)	33 (10)	
Owned	122 (17)	57 (14)	65 (20)	**0,04**
Derelict	624 (83)	346 (86)	278 (80)	
Vaccinated	78 (11)	35 (8)	43 (12)	0,05
Unvaccinated	674 (89)	368 (92)	300 (88)	
Category 2	612 (81)	375 (93)	237 (69)	**<0,001**
Category 3	132 (19)	28 (7)	104 (30)	
Category 4	2 (0,3)	0 (0)	2 (0,2)	
Anatomy				**<0,001**
Lower Exstremity	159 (21)	43 (11)	116 (34)	
Upper Extremity	444 (59)	304 (75)	140 (41)	
Head-Face	80 (9,5)	5 (1,2)	33 (9,6)	
Body	38 (8)	39 (9,7)	41 (12)	
Multiple	25 (3,3)	12 (3)	13 (3,8)	
< 24 hour	704 (94)	372 (92)	332 (97)	
24-72 hour	41 (6)	30 (8)	11 (3)	
>1 week	1 (0,2)	1 (0,2)	0 (0)	**0,018**
Rabies Vaccine	745 (99)	402 (99)	343 (100)	
3 doses	44 (6)	31 (7,7)	13 (3,8)	0,07
4 doses	632 (84)	336 (84)	296 (86)	
5 doses	69 (5)	35 (8,7)	34 (10)	
Immunglobulin	73 (10)	18 (4,5)	55 (16)	**<0,001**
Antibiotic	150 (21)	55 (14)	95 (28)	**<0,001**
Oral	124 (17)	54 (13)	70 (20)	
Parenteral	26 (3,4)	1 (0,2)	25 (7,3)	
Vaccine Compliance	744 (99)	401 (99)	343 (100)	0,2
Suture	41 (5)	1 (0,2)	40 (5)	**<0,001**
Hospitalization	23 (3)	1 (0,2)	22 (6,4)	**<0,001**

Table-3: Characteristics of Rabies Risk Animal Exposure Cases

Discussion

Rabies is a preventable disease however, it is a public health problem that maintains its importance in the world and in our country, as it is a fatal disease after the disease begins. The high risk of death after getting rabies, the inadequacies in treatment, and the fact that it can be prevented by vaccination and protection precautions increase the importance of prophylaxis after exposure to rabies risk. In a study conducted by Söğüt et al. in our country, it was shown that in cases of suspected rabies risky contact, the applications made from the city center were higher than the applications made from the rural areas. In our study, in parallel with the literature, the rate of applications from the city center was higher than those from the rural areas (12). This can be explained by the high number of stray animals in the city center and the high level of perception and knowledge about rabies vaccination.

In many studies, dogs are the most common pet encountered in rabies risky contact worldwide. In the studies conducted by Yılmaz et al. and also by Söğüt et al. in our country, the most frequent contact with rabies risk is dogs (12-13). In our study, on the contrary to the literature, contact with cats was more frequent. In the study of Şengöz et al., while 70% of contacts with animals at risk of rabies were stray, only 6% of animals were vaccinated (14). Similarly, in the study of Gülaçtı et al., more than half of the cases had contact with stray animals (15). In our study, 84% of contacts with animals at risk of rabies were with stray animals, while only 11% of animals were vaccinated. Cases of contact with suspected rabies can be reduced by adopting stray animals, increasing shelters, and regularly vaccinating both stray animals and pets.

In the study of Kocabaş et al., 61% of rabies risky animal contact cases were category III and 39% were category II, and the anatomical region where contact was most common was the upper extremity (5). In our study, while the rate of category 2 cases was higher, the most common contact area was the upper extremity. This can be explained by the higher

incidence of cat contact cases in our study, and more scratching in risky contact with cats and more bites in contact with dogs. In our study, almost all of the rabies risky contact cases were treated with wound cleaning and vaccination, while rabies immunoglobulin was administered to only 10%. In a study conducted in the United States of America, the rate of rabies vaccination in contact with rabies risk was determined as 6.7%. In the same study, while the rate of rabies immunoglobulin administration together with the vaccine was found to be high, it was shown that the rate of rabies vaccine was higher in less developed countries and the administration of immunoglobulin together with the vaccine was lower (16,17). The high rate of rabies vaccination in our study can be explained by the high rate of contact with stray and unvaccinated animals. The low administration rates of rabies immunoglobulin can be explained by the fact that scratching and superficial category 2 animal contact are higher than biting and deep category 3 animal contact. Similarly, rabies immunoglobulin applications were higher in the cases with rabies risky contact with the dog than the contact with the cat. This can be explained by the fact that the contact with the cat is more scratching and superficial injury, and the contact with the dog is more biting and deep injury. In our study, in parallel with the literature, the rates of antibiotic use, tetanus prophylaxis, suturing and hospitalization were higher in cases of contact with dogs at risk of rabies than in contact with cats. This can be explained by the fact that contact with dogs at risk for rabies causes both multiple anatomical regions and deeper injuries compared to contact with cats.

In the study of Ramezankhani et al., the rate of local side effects after rabies vaccine and immunoglobulin applications after exposure to rabies risk was found to be 4%, and the rate of systemic side effects such as fever was 2.5% (18). In the study conducted by Kocabaş et al. in our country, it was observed that side effects such as local swelling and redness were 4.9%, and systemic side effects such as fever were 12% (5). In our study, in parallel with the literature, the rate of side effects was very low which is 0.5%. This has shown again that rabies vaccines and immunoglobulin administrations are very safe when applied with the right technique.

While the rate of compliance with the vaccination program and continuation of vaccination after exposure to rabies risk was close to 100% in previous studies conducted in Europe and our country, it was much lower in studies conducted in countries such as Thailand and the Ivory Coast (19,20). In our study, full compliance with the rabies vaccine schedule was 99%. This can be attributed to the socio-cultural level, the difficulty of accessing health services, and the low level of knowledge of the society about rabies in these countries. It emphasizes the importance of raising awareness of the society, increasing the level of knowledge and providing education to the society about rabies, which is a disease that can be prevented by post-exposure prophylaxis and vaccination.

Limitations

The main limitations of our study are that it is retrospective and the information about some rabies-risk contact cases cannot be accessed.

Conclusion

As a result, our study shows that the cases of suspected rabies contact should be mostly with stray and unvaccinated animals, and precautions such as vaccinating and sheltering stray animals should be increased. The low rate of vaccination in owned pets showed that the knowledge level of the society about animal vaccination and vaccination opportunities should be increased. Rabies, which is still a deadly public health problem for the whole world and for our country, can be prevented by vaccination, post-exposure prophylaxis practices and community education.

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