



The Relationship Between Location of the Bite Incidents and the Use of Antivenom in Patients Presenting with Snakebites in Kastamonu Region

Kastamonu Bölgesinde Acil Servise Yılan Isırması Tanısı ile Başvuran Hastalarda Isırmanın Gerçekleştiği Bölge ve Antivenom Kullanımının İlişkisi

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ABSTRACT

INTRODUCTION: Snakebites are rarely encountered and often neglected, but extremely fatal injuries. The most critical decision in the treatment of snakebites is the use of antivenom.

METHODS: A total of 50 patients with snakebites presented to the Kastamonu Public Hospital emergency department between 2013 and 2020 were examined. Patients were classified according to whether antivenom was given or not and the locations where the snakebite occurred.

RESULTS: It was observed that 14 (28%) of 50 patients presented with snakebites were administered antivenom. Antivenom was given to all (100%) patients who presented from Doğanyurt, Bozkurt, Taşköprü districts and half (50%) of the patients who presented from Azdavay and Şenpazar.

DISCUSSION AND CONCLUSION: Venomous snakes are seen in Kastamonu and surrounding districts. This study was conducted to determine the locations where the most antivenom-requiring snakebites occur.

Keywords: kastamonu, snake, antivenom

ÖZ

GİRİŞ ve AMAÇ: Yılan ısırıkları nadir rastlanan ve genellikle ihmal edilen ancak son derece ölümcül yaralanmalardır. Yılan ısırıklarının tedavisinde en kritik karar antivenom kullanımınıdır.

YÖNTEM ve GEREÇLER: 2013 – 2020 yılları arasında Kastamonu Devlet Hastanesi acil servisine başvuran 50 yılan ısırığı olgusu incelemeye alındı. Hastalar antivenom verilip verilmemesi ve yılan ısırığının gerçekleştiği bölgelere göre sınıflandırıldı.

BULGULAR: Yılan ısırmasıyla başvuran 50 hastanın 14'üne (%28) antivenom verildiği gözlemlendi. Doğanyurt, Bozkurt ve Taşköprü ilçelerinden başvuran hastaların hepsine(%100), Azdavay ve Şenpazar'dan başvuran hastaların da yarısına(%50) antivenom verilmiş olduğu izlendi.

TARTIŞMA ve SONUÇ: Kastamonu ve çevre ilçelerinde zehirli yılanlar görülmektedir. Bu çalışma, bölgemizde en çok antivenom gereksinimi olan yılan ısırıklarının gerçekleştiği bölgeleri belirlemek için yapıldı. Doğanyurt, Bozkurt ve Taşköprü bölgelerindeki yılanların daha zehirli olduğu sonucuna varıldı.

Anahtar Kelimeler: kastamonu, yılan, antivenom

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INTRODUCTION

Snake bites were reintroduced on the World Health Organization's (WHO) list of Neglected Tropical Diseases (NTD) in 2017 (1). Annual rates of disease and death from snake bites are among the top of the NTDs (2). In 2019, a work was launched by WHO for the prevention and control of this disease (3). This interest has been a warning to draw attention to snake bites and to increase the number of studies on this subject. Snake bites affect an estimated 5 million people a year worldwide. Between 81,000 and 138,000 people die of this disease every year and about three times of that number have permanent physical and psychological sequelae (4).

There are roughly 3,000 snake species in the world. Only 15% of these are accepted as dangerous for humans (5,6). Forty species of snakes are known to exist in Turkey. Viperidae group snakes are seen most frequently. Snakes in this group have venom that can cause serious systemic and tissue damage, and the venom usually shows hematotoxic and rarely neurotoxic effect (7). Snake venom may cause systemic poisoning such as diffuse intravascular coagulation or loss of the extremity due to tissue necrosis (6,8).

The only potent antidote to prevent the systemic effects of snake bite poisoning is antivenom (9). The antivenom contains concentrated immunoglobulins that are obtained from horse, sheep or other domesticated animals by hyperimmunization with

venom. Multivalent (polyspecific) antivenoms are produced against the venom of the most commonly seen and medically most venomous snake species in a given area. Antivenoms have been proven to inhibit hemotoxic and neurotoxic effects of snake venoms and to prevent their systemic effects (9-12). The most important clinical decision in the treatment of snake bites is whether to administer an antivenom.

In this study, we tried to determine in which location snakes with a high potential of poisoning are most commonly seen according to the use of antivenom in cases of snake bites in Kastamonu and surroundings.

MATERIAL AND METHODS

Before the beginning of the study, the necessary approval was received from the Kastamonu University Clinical Research Ethics Committee with the 24/12/2020 dated and 2020-KAEK-143-14.01 numbered decision. This study was conducted retrospectively. The study included a total of 50 patients who presented to the emergency department of Kastamonu Public Hospital with the complaint of snake bites between January 2013 and December 2020. Patients' file records were examined and length of stay in the hospital, whether antivenom was administered or not, which extremity the bite was from, and whether there was ward or intensive care admission were evaluated. The patients were called via their phone numbers obtained from the hospital registry system, and after receiving their consents,

the location (district, village) of the snake bite incident was learned.

RESULTS

Of the 50 patients who presented due to snake bites between January 2013 and December 2020, 29 (58%) were female and 21 (42%) were male. The mean age was found as 46.82 years. Of all patients, 5 (10%) were < 18 yo and 45 were \geq 18 yo. Systemic findings were observed in 11 (22%) patients, whereas only local findings were detected in 39 (78%) patients. As systemic findings; abdominal pain, nausea, vomiting, and hypotension were seen in five patients, tachycardia and hypotension in five patients, and diffuse skin rash in one patient.

We classified our patients as bitten from the lower extremity and upper extremity. Accordingly, 52% (n = 26) of the patients had been bitten from the lower extremity and 48% (n = 24) from the upper extremity.

When total length of stay in the hospital was examined; 23 (46%) patients were followed-up for 8 hours, 19 (38%) patients for 24 hours, and 8 (16%) for 48 hours. Of these patients, 7 (14%) were admitted to the intensive care unit, 12 (24%) were followed-up in the wards and 31 patients (62%) were followed-up and treated in the emergency department. Tetanus prophylaxis was also administered to all patients.

It was found in our study that 36 (72%) patients did not receive antivenom therapy and 14 (28%) received antivenom therapy (Table 1). While systemic findings were observed in 11 of the patients who were administered antivenom, it was recorded that antivenom was administered to 3 patients as local findings progressed.

When our patients were evaluated according to the location of snake bite incidents, it was found that the patients applied from 14 regions. These regions included Kastamonu city center and 13 districts. Kastamonu province has a total of 19 districts. Among the 50 patients included in this study, there were no presentations from six districts. The locations where the snake bites occurred were found as Kastamonu city center (12 patients), Azdavay (6 patients), Daday (5 patients), Araç (4 patients), Küre (4 patients), Şenpazar (4 patients), Devrekani (3 patients), Bozkurt (2 patients), Cide (2 patients), Çatalzeytin (2 patients), İhsangazi (2 patients), Pınarbaşı (2 patients), Doğanyurt (1 patient) and Taşköprü (1 patient).

Of the patients who received antivenom therapy; 3 patients presented from Azdavay, 2 patients from Kastamonu city center, 2 patients from Bozkurt, 2 patients from Daday, 2 patients from Şenpazar, 1 patient from Küre, 1 patient from Doğanyurt and 1 patient from Taşköprü (Table 2).

Table 1		Use of ANTIVENOM			
		Yes		No	
Gender	Female	6	%42,85	23	%63,88
	Male	8	%57,14	13	%36,11
Hospitalization	Emergency services	1	%7,14	30	%83,33
	Service	7	%50	5	%13,88
	ICU	6	%42,85	1	%2,77
Follow-up time	8 hour	0	%0	23	%63,88
	24 hour	7	%50	12	%33,33
	48 hour<	7	%50	1	%2,77
Extremity	Lower	8	%57,14	18	%50
	Upper	6	%42,85	18	%50
Finding	Local	3	%21,42	36	%100
	Systemic	11	%78,57	0	%0
Age	>18 years	2	%14,28	3	%8,33
	< 18 years	12	%85,71	33	%91,66
Total		14	%28	36	%72

Table 2	Counties	Total patients	Use of ANTIVENOM		
			Yes		No
Center	12	2	%16,66	10	%83,33
Azdavay	6	3	%50	3	%50
Araç	4	0	%0	4	%100
Bozkurt	2	2	%100	0	%0
Cide	2	0	%0	2	%100
Çatalzeytin	2	0	%0	0	%100
Daday	5	2	%40	3	%60
Devrekani	3	0	%0	3	%100
Doğanyurt	1	1	%100	0	%0
İhsangazi	2	0	%0	2	%100
Küre	4	1	%25	3	%75
Pınarbaşı	2	0	%0	2	%100
Şenpazar	4	2	%50	2	%50
Taşköprü	1	1	%100	0	%0

Table 3. Clinical Staging, Antivenom Use and follow-up Steps in Snake Bites (22)

Degree of intoxication	Clinic	Use of antivenom	Monitoring
No poisoning Stage 0	Traces of teeth can be seen. There are no signs of local or systemic poisoning after the bite.	Not used	Can be discharged after 8 hours of observation
Mild poisoning Stage 1	Mild tissue swelling, mild ecchymosis, no systemic findings, normal laboratory findings (Platelet count is normal), Systolic blood pressure > 90 mmHg	Not used	Can be discharged after 12 hours of observation
Medium poisoning Stage 2	Increasing swelling, pain in that area, ecchymosis, prothrombin time (PT) and "International Normalized Ratio" (INR) prolonged, Platelet value <80.000, Systolic blood pressure > 90 mmHg	Depending on the severity of the poisoning, two vials of antivenom are recommended.	It should be watched in a section where it can be monitored.
Severe poisoning Stage 3	Progressive swelling, pain in that area, bullae, necrosis are observed. PT prolonged, Platelet value <80.000, Systolic blood pressure <80 mmHg, Serious systemic symptoms, coagulopathy (Bleeding from nose, stomach, etc.	Depending on the severity of poisoning, four vials or more antivenom are recommended.	It should be monitored in intensive care.

DISCUSSION

Snake bites are one of the rare diseases seen in the summer months. In this study, we tried to evaluate a total of 50 snake bite cases seen in Kastamonu and surroundings, according to antivenom administration criterion.

Patients presenting to the emergency department with the complaint of snake bites should be monitored and oxygen and fluid therapy should be

initiated. The wound site should be cleaned, the bitten extremity should be kept elevated and its mobilization should be prevented. Jewelry in the extremity should be removed and tetanus prophylaxis should be performed. Although not routinely recommended, antibiotics should be kept in mind and antivenom therapy should be initiated in the early period, when necessary (13-17).

In our study first intervention, tetanus prophylaxis,

wound care and antivenom treatments of the patients who presented from out of Kastamonu city center were performed in the district hospital and they were then referred to our hospital.

Antivenoms are produced specifically against venoms of several species used that are used in the production process. In the case of snake bite, the snake should be recognized and an antivenom should be used accordingly. The production of antivenoms is very costly, transport and storage are difficult (18). A small number of snake bites require using of an antivenom and so, antivenom administration criteria should be well known.

Indications of Antivenom Treatment

A. Systemic Intoxication Findings

- 1- Hemorrhagic disorders: Spontaneous systemic bleeding, coagulopathy
- 2- Cardiovascular disorders: Shock, hypotension, pulmonary edema, electrocardiographic disturbances
- 3-Acute renal failure, elevated creatine phosphokinase due to diffuse muscle breakdown.
- 4- Serious systemic symptoms (Hypoxia, metabolic acidosis, etc.)
- 5- Impaired consciousness with no apparent cause, neurological involvement

Severe Tissue Injury Findings

Serious edema, bruising, necrosis, and hemorrhagic bullae in the bitten extremity (involving about half of the extremity) (19).

A clinical staging system has been developed in order to guide treatment and facilitate follow-up of a patient with snake bite (Table 3). Owing to this staging, unnecessary antivenom administration is avoided and complications that may occur related to antivenom are prevented (19).

Although antivenom therapy is not recommended routinely because of the risk of allergy and anaphylactic reaction, it should be performed in patients with systemic poisoning or severe local tissue reaction. Susceptibility can be evaluated with a skin test before giving antivenom, and antihistamines, corticosteroids, and adrenaline should be easily accessible during this treatment.

Snake antivenom (PoliseraTM, Vetal Serum, Adiyaman) was produced in our country for the first time in 2014 (20), and PolivalanTM snake antivenom (5 mL) distributed by the Public Health Directorate in 2019. Both antivenomes have immunoglobulin against *V. ammodytes*, *V. xanthina*, and *V. Lebetina* species from Viperidae group, which are the most common in our country (21).

The main treatment option is antivenom in venomous snake bite cases (22). Antivenom therapy should be applied in patients with progressing local or systemic symptoms. The rate of antivenom use varies between 16-80% in the literature(23 -25). In a study conducted in the Eastern Black Sea Region, the rate of antivenom use was reported to be 25.9%

(26). Similarly, in our study the rate of antivenom use was 28%.

Complications or misapplications resulted from systemic involvement and delayed treatment may cause mortality (27). In our study, all patients who did not receive antivenom therapy were discharged without any complication, which shows that the patients received adequate treatment.

Almost all of our patients who received antivenom were monitored for at least 24 hours in the ward or intensive care unit. Only one patient was followed-up in the emergency service and discharged, and that patient was also monitored for 24 hours. It can be concluded from these results that there is less tendency to give anti venom unnecessarily in our hospitals and district hospitals.

We could not reach sufficient information about the stages of the patients administered antivenom. However, considering the follow-up durations, it is estimated that these patients had stage 2-3 snake bite findings.

In this study conducted in Kastamonu, we could not obtain data about the species of snakes that have bitten. No literature data could be found regarding which snakes were mostly seen in our city.

The most common patient presentations have been from Kastamonu city center with 12 patients, but only two of them were administered antivenom.

It was observed that antivenom was given to all (100%) patients who presented from Doğanyurt,

Bozkurt and Taşköprü districts and half (50%) of the patients who presented from Azdavay and Şenpazar. We concluded that the snakes that have bitten the patients from these districts might be of a more venomous type.

None of the patients who presented from Araç, Cide, Çatalzeytin, Devrekani, İhsangazi and Pınarbaşı districts due to snake bites were given antivenom. However, the results do not mean that the snakes found in these areas are non-venomous. It can be thought that all snake bite cases in those regions might have not presented to our hospital, but it is known that considering the possibilities, the hospitals in those regions have limited patient follow-up capacities and patients in serious conditions are definitely transferred to the hospital in the city center.

This study was planned to both demonstrate that venomous snakes may also be encountered in Kastamonu and surroundings, and to identify the regions with the highest need for antivenom. Accordingly, it was concluded that the snakes in Doğanyurt, Bozkurt and Taşköprü regions are more poisonous. Since the ideal antivenom production should be specific to the snake species, further more comprehensive studies are needed about venomous snake species seen in this region.

Ethics Committee Approval: Ethical approval was obtained from Kastamonu Ünivercity Hospital Clinical Research Ethics Committee (24.12.2020, protocol code 2020, ethics committee number 2020KAEK-143-14.01).

Authors Contributions:

Concept: M.K., F.M.K.G., Design: M.K., Supervision: Ö.Ö., Resources:O.N.A., Materials: Ö.Ö., O.N.A., Data Collection:O.N.A., Analysis: M.K., Literature search:F.M.K.G., Writing:Ö.Ö., M.K., Review:M.K., F.M.K.G.,

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