

# ORIGINAL ARTICLE

## Özgün Araştırma

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## Epidemiological and Clinical Features Of Eye-Related Emergency Department Visits Involving An Ophthalmology Consultation In Geriatrics

## Acil Servise Başvuran ve Oftalmoloji Konsültasyonu İstenen Geriatrik Hastaların Epidemiyolojik ve Klinik Özelliklerinin Belirlenmesi

### ABSTRACT

#### Objective:

This study aimed to examine the epidemiological and clinical characteristics of geriatric patients who presented to the emergency department (ED) with ocular complaints and were referred for an ophthalmology consultation and to evaluate the efficacy of visual acuity (VA) as an indicator of urgency of care.

#### Material and Methods:

The data of 730 patients were retrospectively analyzed. Age, gender, presentation complaints, presentation time, pre-diagnoses made by the ED physician, definitive diagnosis, VA (logMAR) measurements and urgency of care were recorded.

#### Results:

The mean age of the patients was  $72.7 \pm 7.1$  years. The percentage of patients presenting to ED during evening shift hours was 60.3%, and the rate of presentation on weekdays was 75.8% ( $p < 0.05$ ). The agreement rate between the pre-diagnosis of the ED physicians and the final diagnosis of the ophthalmologists was 65.2%. The most common reasons for presenting to ED were infection (21%) and trauma (19.9%). No pathological finding was present in 10.1%. According to the classification of urgency of care, 52.6% of the cases were evaluated as urgent, 24.3% as semi-urgent, and 23.1% as non-urgent. VA was the lowest ( $1.49 \pm 1.06$  logMAR) in the urgent group ( $p < 0.01$ ).

#### Conclusion:

We consider that low VA can be of great help in evaluating the urgency of geriatric patients presenting to ED. In addition, rather than ED, geriatric patients applying to health institutions where they can receive outpatient clinic service for non-emergency ocular diseases may allow ED to provide better service to other patients with more serious problems.

#### Key Words:

Geriatrics, Emergency department, Eye-related emergency, Ocular emergency

**ÖZ****Giriş:**

Oküler şikayetle acil servise (AS) başvuran ve oftalmoloji konsültasyonu istenen geriatrik hastaların epidemiyolojik ve klinik özelliklerinin incelenmesi; görme keskinliğinin aciliyet göstergesi olarak etkinliğinin değerlendirilmesi.

**Gereç ve Yöntemler:**

Yedi yüz otuz hastanın verileri retrospektif olarak incelendi. Yaş, cinsiyet, başvuru şikayetleri, başvuru zamanı, AS hekimi tarafından konulan ön tanıları, kesin tanıları, görme keskinlikleri (logMAR), aciliyet durumları kaydedildi.

**Bulgular:**

Hastaların yaş ortalaması  $72,7 \pm 7,1$  idi. Saat olarak akşam vardiyasında AS başvuru oranı %60,3; gün dağılımında da hafta içi başvuru oranları da %75,8 idi ( $p < 0,05$ ). Acil hekimlerin ön tanısı ile oftalmologların kesin tanı uyum oranı %65,2 idi. Hastaların en sık başvuru nedeninin enfeksiyon (%21) ve travma (%19,9) olduğu görüldü. Hastaların %10,1'inde patolojik bulgu izlenmedi. Aciliyet sınıflamasına baktığımız zaman ise %52,6 hasta acil, %24,3 hasta yarıacil ve %23,1 hasta acil olmayan olarak değerlendirildi. Görme keskinliğinin acil grupta en düşük ( $1,49 \pm 1,06$  logMAR), acil olmayan grupta ( $72,82 \pm 7,3$  logMAR) en yüksekti ( $p < 0,01$ ).

**Sonuç:**

Özellikle AS başvuran geriatrik hastaların aciliyet durumlarının değerlendirilmesinde düşük görme keskinliğinin bize oldukça yardımcı olabileceğini düşünmekteyiz. Ayrıca hastaları acil olmayan oküler hastalıklar için AS başvurmak yerine, poliklinik hizmeti alabilecekleri sağlık kuruluşlarına başvurmaları AS daha ciddi sorunları olan hastalara daha iyi hizmet vermesine olanak sağlayabileceğini düşünmekteyiz.

**Anahtar Sözcükler:**

Geriatrik, Acil servis, Gözle ilişkili aciller, Oküler aciller

**INTRODUCTION**

Globally, individuals aged 65 and over are considered as the elderly, and their proportion to the total population is increasing day by day. While the elderly population in Turkey was 6,192,962 (8%) in 2014, it increased by 21.9% in the last five years, reaching 7,550,727 (9.1%) in 2019 (1). Population estimates show that this increase in the elderly population will continue. According to population projections, the elderly population ratio is expected to reach 20% of the population within the next five years (1). The increase in the rate of the elderly population over the years has resulted in the necessity to better identify their health problems and develop appropriate approaches. The aging of the population is a global phenomenon. Among the factors that prevent the elderly from living a healthy life are various psychological and social problems that occur at an advanced age and the high incidence of diseases. Given the aging of the population, the health system must be prepared to serve an increasing number of geriatric individuals. The elderly is affected by

multiple diseases affecting morbidity. Signs and symptoms vary for each individual and are generally atypical, making it often difficult to diagnose patients. With the growing geriatric population, their need for healthcare services also increases (2). In particular, geriatric patients constitute a significant portion of presentations to the emergency department (ED) (3). Ünsal et al. reported that the rate of ED presentation among geriatric patients was 12.1-13.8% (4). Previous studies have also reported that geriatric patients present to ED more frequently and with complex problems, require more radiological and laboratory tests, and receive longer-term treatment due to their existing comorbidities (5,6).

Visual function is one of the important indicators of health (7). In the geriatric population, eye diseases are very common and their impact on the quality of life of patients is very high. In addition, ocular pathologies constitute an important part of ED presentations. Ophthalmological pathologies that increase with age can cause the irreversible loss of eye function if not properly diagnosed and treated (8,9). It is important to examine the ED presentation characteristics of the patients for the development of diagnosis and treatment algorithms. In this study, we aimed to examine the epidemiological and clinical features of geriatric patients who presented to the ED of a tertiary hospital with eye complaints and were referred to an ophthalmologist for an emergency examination and to evaluate the efficacy of visual acuity as an indicator of urgency of care.

**MATERIAL and METHODS**

**Study Population:** This retrospective study was approved by the local ethics committee of Akdeniz University Faculty of Medicine (Approval Number: KA EK-926; 09.12.2020) where the study was conducted in compliance with the ethical standards set out in the Declaration of Helsinki. The records of patients aged 65 and over who presented to ED and were referred for an ophthalmology consultation between January 1, 2018 and December 31, 2019 were retrospectively reviewed. Patients whose records could not be reached were excluded from the study.

**Data Collection:**

The patients' age, gender, presentation complaints, presentation time, pre-diagnoses made by the ED physician, definitive diagnoses, visual acuity (logMAR) measurements, urgency of care (urgent, semi-urgent, and non-urgent), hospitalization requirement, and repeated ED presentations with the same complaint were recorded. In addition, for the patients presenting with trauma, the type and cause of trauma, location of injury, and surgical requirement were noted. Presentation hours were divided into three shifts: morning (8 a.m. to 4 p.m.), evening (4 p.m. to 12 a.m.), and night (12 a.m. to 8 a.m.). In addition, the seasonal and weekday/weekend distributions of the presentations were examined. The visual acuity of the eye causing the complaints was recorded, and if there were complaints in both eyes, the visual acuity of the eye with poorer visual function was evaluated. The LogMAR visual acuity of 2 was used to determine patients with finger

counting level, and 2.3, 2.8 and 3 were used to determine those with hand movements, light perception, and no light perception, respectively. Outcomes were determined as discharge from ED and admission to the ophthalmology service for surgical or medical treatment.

**Categorization:**

In light of the classifications used in previous studies (10,11), the patients were divided into three groups according to the urgency of care: urgent, semi-urgent, and non-urgent. Possible ocular emergencies were included in the urgent group, semi-emergent ocular findings in the semi-urgent group, non-emergent ocular findings in the non-urgent group, and patients presenting to ED with non-ocular complaints that did not require urgent treatment and underwent etiology-oriented examinations were included in the non-urgent group. Presentations to ED within one month after any eye surgery were evaluated under a separate group. In addition, considering ocular pathologies, the cases were classified as eyelid, anterior segment, posterior segment, orbital, other (non-ocular complaints, examinations for etiology) and normal.

**Statistical Analysis**

Statistical analysis was performed using IBM SPSS, version 21.0 (SPSS Inc., IL-USA) software. To define the sample, continuous variables were expressed as mean ± standard deviation and median (minimum-maximum) values and categorical variables as numbers and percentages. Normality was tested using the Shapiro–Wilk test in groups with a sample size of <50 and the Kolmogorov–Smirnov test in groups with a sample size of >50. In the comparison of the continuous data, the chi-square test was applied to the non-normally distributed data, and the independent-samples t-test was used for the data with a normal distribution. The results were evaluated at the 95% confidence interval, and a p value of <0.05 was considered statistically significant.

**RESULTS**

The data of 730 patients aged 65 and over who presented to ED between January 1, 2018 and December 31, 2019 and were referred for an ophthalmology consultation were analyzed. The data on the demographic and presentation characteristics of the patients are summarized in Table I. The mean age of the patients was 72.7 ± 7.1 years, and the presentation rate was higher among women (54.2%). Of the presentations, 60.3% occurred during the evening shift, 32.3% during the night shift, and 7.4% during the morning shift. The rate of weekday presentations was 75.8%. There was no significant difference in seasonal distribution.

The patients were first evaluated by an ED physician and then referred to an ophthalmologist with a pre-diagnosis. The agreement rate between the pre-diagnosis of the ED physicians and the final diagnosis of the ophthalmologists was 65.2%. Pathologies were observed in the anterior segment in 52.5% of the patients, posterior segment in 21.6%, eyelid in 8.1%, and orbital in 5.1% while extraocular pathologies were seen in 5.1% of the patients and no pathological finding was

present in 10.1% (Table II).

**Table I:** Demographic and presentation characteristics of the patients

		n = 730
Age, mean (SD), years		72.7 ± 7.1
Gender	Male	396 (45.8%)
	Female	334 (54.2%)
Laterality	Right	337 (46.2%)
	Left	293 (40.1%)
	Bilateral	100 (13.7%)
Time distribution	Morning (8 a.m.- 4 p.m.)	54 (7.4%)
	Evening (4 p.m.-12 a.m.)	440 (60.3%)
	Night (12 a.m.- 8 a.m.)	236 (32.3%)
Day distribution	Weekday	553 (75.8%)
	Weekend	177 (24.2%)
Seasonal distribution	Winter	189 (25.9%)
	Spring	176 (24.1%)
	Summer	185 (25.3%)
	Fall	180 (24.7%)

SD standard deviation

**Table II:** Pathology localization and emergency classification of the patients

		n = 730
Localization	Anterior segment (%)	383 (52.5%)
	Posterior segment (%)	158 (21.6%)
	Eyelid (%)	59 (8.1%)
	Orbital (%)	19 (2.6%)
	Other (%)	37 (5.1%)
	Normal (%)	74 (10.1%)
Urgency classification	Urgent (%)	382 (52.3%)
	Semi-urgent (%)	171 (23.4%)
	Non-urgent (%)	177 (24.3%)
Outcomes	Discharge after treatment (%)	625 (85.6%)
	Hospitalization for medical treatment (%)	65 (8.9%)
	Surgical intervention (%)	40 (5.5%)

The most common reasons for ED presentation were infection (21%) and trauma (19.9%). Examining trauma factors, it was seen that the three most common factors were wooden objects (n = 60), falls (n = 26), and traffic accidents (n = 11). Ninety-six (66.2%) of the injuries occurred outdoors and 49 (33.8%) indoors (Table III).

**Table III:** Distribution of the patients according to the causative factor and place of trauma

		n = 145
Trauma factor	Wooden object	60 (41.4%)
	Fall	26 (17.9%)
	Traffic accident	14 (9.6%)
	Metal	11 (7.5%)
	Chemical burn	10 (6.9%)
	Assault	7 (4.8%)
	Animals	5 (3.5%)
	Plastic	5 (3.5%)
	Gravel	5 (3.5%)
	Stone	2 (1.4%)
Place	Outdoor	96 (66.2%)
	Indoor	49 (33.8%)

According to the urgency classification, 52.6% of the cases were evaluated as urgent, 24.3% as semi-urgent, and 23.1% as non-urgent (Table II). The distribution of the diagnoses according to the urgency categories are given in Table IV and demographic and presentation characteristics according to urgency classifications are shown in Table V. There was no statistical difference in the urgency classification of the patients in terms of gender and seasonal distributions ( $p > 0.05$ ). Concerning the days of the week, there was a higher rate of weekday presentations in the urgent group ( $p < 0.01$ ). There was no difference between the morning and evening night shifts in terms of urgency distribution ( $p = 0.521$ ). Visual acuity was the lowest ( $1.49 \pm 1.06$  logMAR) in the urgent group and the highest ( $72.82 \pm 7.3$  logMAR) in the non-urgent group ( $p < 0.01$ ). The most common outcome was hospitalization in the urgent group and discharge from ED after treatment in the non-urgent group ( $p < 0.001$ ). Of all the patients, 625 (85.6%) were discharged after the ophthalmological examination, and 105 (14.4%) were hospitalized. Surgical treatment was applied to 40 (5.5%) of the hospitalized patients (Table II). Primary repair was performed in 15 (2.1%) patients due to open globe injury, evisceration was undertaken in 12 (1.6%) patients, lens extraction and/or intraocular lens implantation in eight (1.1%) patients, cryotherapy in four (0.5%) patients, and primary suturing in one (0.1%) patient due to conjunctival incision.

**Table IV:** Distribution of the patients' diagnoses according to the urgency classification

Diagnosis	n	%
<b>Urgent</b>	<b>384</b>	<b>52.6</b>
Ocular hypertension	59	8
Ocular surface injury	46	6.3
Corneal abscess	32	4.4
Vitreoretinal hemorrhage	28	3.8
Traumatic subconjunctival hemorrhage	26	3.6
Retinal detachment	24	3.3
Eyelid injury	22	3
Retinal vascular occlusion <sup>a</sup>	18	2.5
Orbital bone fracture	17	2.3
Uveitis	16	2.2
Endophthalmitis <sup>b</sup>	15	2.1
Open globe injury	15	2.1
Optic neuropathy	13	1.8
Keratitis	13	1.8
Spontaneous corneal perforation	10	1.4
Traumatic dislocation of lens	7	0.9
Herpes infection	6	0.8
Corneal ulcer	6	0.8
Hyphema	5	0.7
Burn injury	5	0.7
Orbital infection	1	0.1
<b>Semi-urgent</b>	<b>177</b>	<b>24.3</b>
Conjunctivitis <sup>c</sup>	42	5.8
Bullous keratopathy	31	4.2
Non-traumatic epithelial erosion	27	3.7
Non-traumatic subconjunctival hemorrhage	25	3.4
Infection of skin <sup>d</sup>	14	1.9
Senile macular degeneration	10	1.4
Retinopathy <sup>e</sup>	10	1.4
Herpes zoster ophthalmicus <sup>f</sup>	8	1.1
Nasolacrimal duct stenosis <sup>g</sup>	6	0.8
Dry eye	4	0.6
<b>Non-urgent</b>	<b>169</b>	<b>23.1</b>
Normal	79	10.8
Non-ocular diseases	27	3.8
Posterior vitreous detachment	21	2.9
Surgery-related problems <sup>h</sup>	12	1.6
Cataract	9	1.2
Cerebrovascular accident	7	0.9
Epiretinal membrane	6	0.8
Chalazion	5	0.7
Blepharitis	2	0.3
Retinal dystrophy	1	0.1

- a Including retinal artery and vein occlusion
- b Including postoperative and endogenous endophthalmitis
- c Including bacterial, viral and allergic conjunctivitis
- d Including cellulitis outside the orbit and dermatitis
- e Including diabetic, hypertensive and myopic retinopathy
- f Including extraocular skin infection
- g Including dacryocystitis
- h Including complications during cataract surgery, postoperative wound check, unspecific discomfort after ocular surgery, and nasolacrimal stent dislocation

**Table V:** Demographic and presentation characteristics according to the urgency classification

		Urgent (n = 384)	Semi-urgent (n = 177)	Non-urgent (n = 169)	p
Age, mean (SD), years		75.52±7.09	72.88±6.99	72.82±7.3	0.781*
Visual acuity (logMAR)		1.49±1.06	0.98±0.9	0.71±0.78	<0.001*
Gender	Male	220	93	83	0.179**
	Female	164	84	86	
Laterality	Right	193	75	69	0.545**
	Left	176	68	49	
	Bilateral	47	35	18	
Time distribution	Morning (08.00-16.00)	31	14	9	0.521**
	Evening (16.00-24.00)	200	139	101	
	Night (24.00-08.00)	112	59	65	
Day distribution	Weekday	309	112	132	<0.001**
	Weekend	75	65	37	
Seasonal distribution	Winter	107	49	33	0.094**
	Spring	98	39	39	
	Summer	92	38	55	
	Fall	87	51	42	
Outcome	Discharge after treatment	292	168	165	<0.001**
	Hospitalization for medical treatment	52	9	4	
	Surgical intervention	40	0	0	

SD standard deviation. \*Independent-samples t-test. \*\*Chi-square test

## DISCUSSION

The geriatric population is growing globally, and the rate of referrals to healthcare institutions is also increasing (2). In previous studies, the rate of ED presentations with ophthalmic complaints was reported to be between 1.5 and 3.4% (8,10-12). Patients presenting to ED with eye complaints are first evaluated by an ED physician, and ophthalmology consultation is requested in cases deemed necessary. In geriatric patients presenting to ED with ocular complaints, the agreement rate between the pre-diagnosis of ED physicians and ophthalmologists was reported as 65.2% in a previous study (13), which is similar to our finding. For the trauma and infection cases, we found this rate to be 94.5% and 80.9%, respectively. Both anamnesis and physical examination findings of patients diagnosed with trauma and infection provide more guiding data. This results in higher agreement

between their pre-diagnoses and definitive diagnoses. We determined that a higher proportion of ED presentations belonged to the female patients (54.2%). When we examined the characteristics of the presentation time, we detected no difference in seasonal distribution, similar to previous studies (11). We observed that there was a higher rate of presentations on weekdays (75.8%) compared to weekends (24.2%), which is also consistent with the literature (11). Concerning the distribution of presentations according to the hours of the day, they mostly occurred during the evening shift (60.3%). We consider that the reason for the lower number of daytime presentations (7.4%) is that the patients can be directly examined by an ophthalmologist during working hours.

The examination of the localization of ophthalmic pathologies revealed that the most common localization was the anterior segment (52.5%). Since anterior segment pathologies generally cause pain and redness, patients are more concerned about these symptoms; therefore, they present to ED at a higher rate due to these complaints. The most frequent diagnoses of the patients were infection and trauma. Among those diagnosed with trauma, ocular surface trauma and traumatic subconjunctival hemorrhage were the most common. Trauma was caused by wooden objects in 60 patients, falls in 26 patients, and traffic accidents in 11 patients. Similarly, previous studies defined the most common causes of ocular trauma in geriatric patients as falls and wooden objects (14,15). We found that 45.2% of the trauma patients lived in rural areas, and injuries related to wood occurred especially after wood chopping and tree pruning. Ninety-six (66.2%) of the injuries occurred outdoors, and 49 (33.8%) indoors. Open globe injuries were observed in 15 of the trauma cases.

In our study, according to the urgency classification, 52.6% of the cases were evaluated as urgent, and the rate of the patients in the urgent group was similar to previous studies (41.2% and 74.7%) (11,16). In the urgent group, the most frequent reasons for ED presentation was glaucoma crisis (8%). When we examined the patients with high intraocular pressure in more detail, we found that 84.7% had been previously diagnosed with glaucoma but were not properly or regularly using the prescribed medical treatment. In the literature, it has been reported that 30-80% of glaucoma patients do not comply with medical treatment (17,18). We also found that compliance with medical treatment was lower in the geriatric patient group; therefore, it is very difficult to control intraocular pressure in these patients. Uncontrolled intraocular pressure can cause glaucoma progression, irreversible loss of vision, and severe eye pain (19-22).

We did not detect a significant difference in the gender and seasonal distribution of patients according to the urgency classification. Concerning the distribution according to the days of the week, weekday presentations were higher in the urgent group. However, there was no significant difference between the morning, evening and night shifts in relation to the rate of presentations. Visual acuity was significantly lower in the urgent group, which is in agreement with previous studies (16). Rossi et al. developed an examination algorithm called the Rome Eye Scoring System for Urgency

and Emergency to be used in the triage of patients with ophthalmology complaints. In this system, redness, pain, loss of vision, and open eye risk were used as parameters, and patients were classified as urgent or non-urgent according to the scoring made based on these parameters (23). Similarly, other studies have reported that low visual acuity can be used for hospitalization indication and ED triage (24,25). We also consider that visual acuity is an important factor in showing the urgency of ED cases during the examinations performed before referring them for an ophthalmology consultation.

There are many reasons why the geriatric population is more difficult to treat than younger patients. They require special attention and care from the first time they present to the hospital. Obtaining history can also be more difficult than expected, especially when there are communication problems. In this group, symptoms are generally atypical, and there are often no classical physical examination findings. In addition, many diseases occur almost exclusively in the elderly and cause permanent problems if not properly treated. Therefore, there is a need for a diagnosis system and medical care services specific to geriatric patients. It is especially important to evaluate the urgency of geriatric patients that present to ED. We consider that low visual acuity can be of great assistance in this evaluation. In addition, closer outpatient clinic follow-up and easier-to-use and less (combined) drug choices can be preferred to increase compliance with prescribed medical treatment.

Our study also has certain limitations, such as a relatively small sample size and retrospective design. In addition, patients who presented to ED and requested an ophthalmology consultation were included in the study, but the data of those with ocular complaints who were treated and discharged by ED physicians were excluded, which may have resulted in missing information. Despite these limitations, this study also has some strengths. While similar previous studies used diagnosis codes (10,11), we directly evaluated the ophthalmologist examination notes, increasing the accuracy of the diagnoses. In addition, in contrast to previous research targeting the general population (16), we evaluated a specific patient group; i.e., geriatric patients; therefore, we consider our data to be valuable from an epidemiological point of view despite the smaller number of patients.

## CONCLUSION

We consider that low visual acuity can be of great help in evaluating the urgency of geriatric patients presenting to ED. Approximately a quarter of geriatric patients that visited ED due to ocular problems were diagnosed with non-urgent conditions. Better informing and encouraging these patients to seek outpatient services rather than ED for non-emergency ocular diseases can allow ED to provide better services to patients with more serious problems. Furthermore, it is important to determine the ED presentation characteristics of the geriatric patients for the development of diagnosis and treatment algorithms.

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## Conflict of interest:

The authors declare that they have no conflict of interest.

## Ethical approval:

This study was approved by the Ethics Committee of the Akdeniz University Faculty of Medicine (KA EK-926; 09.12.2020). 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.

## Author Contributions:

Concept - A.Ç.Y.; Design - A.Ç.Y.; Supervision - A.Ç.Y., H.D.İ.; Resources - A.Ç.Y., H.D.İ.; Materials - A.Ç.Y.; Data Collection and/or Processing - A.Ç.Y.; Analysis and/ or Interpretation - A.Ç.Y.; Literature Search - A.Ç.Y.; Writing Manuscript - A.Ç.Y.; Critical Review – H.D.İ.

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