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## Retrospective Investigation of Patients Referred to the Emergency Department with Chest Pain

### Göğüs Ağrısı Nedeniyle Acil Servise Sevk Edilen Hastaların Retrospektif İncelenmesi

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**Objective:** Chest pain is one of the most common symptoms in emergency department visits, family health centres and pre-hospital emergency health services. The underlying causes can range from myalgia to psychological pain, heart attack to pneumothorax. If the underlying cause is missed, it results in serious mortality and morbidity. Therefore, the management of patients presenting with chest pain becomes very important.

**Materials and Methods:** All patients who were referred to the emergency department with a prediagnosis of chest pain from an external centre, met the inclusion criteria, and admitted to our hospital between 01.01.2020-31.08.2023 were included in our retrospective study conducted at Balıkesir University Faculty of Medicine, Department of Emergency Medicine.

**Results:** The highest number of referrals were from C-role group hospitals and most of the referrals were between 00:00-04:00. It was observed that the applications were more common on weekdays and most common on Fridays. The most common complaint was chest pain and palpitations in February. It was found that the majority of the referred patients were consulted and then hospitalised and the most common hospitalisations were in February. It was observed that the most common hospitalisations were in cardiology and coronary intensive care.

**Conclusion:** By analysing the data we obtained, it was aimed to contribute to the effective use of services in emergency departments and to contribute to the pre-hospital and in-hospital management of patients referred with chest pain.

**Key words:** Emergency Department; Emergency Medical Services; Chest Pain

**Amaç:** Göğüs ağrısı acil servis başvurularında, aile sağlığı merkezlerinde ve hastane öncesi acil sağlık hizmetlerinde en sık görülen semptomlardan biridir. Altta yatan nedenler miyaljiden psikolojik ağrıya, kalp krizinden pnömotoraksa kadar değişebilir. Altta yatan neden atlandığında ciddi mortalite ve morbiditeye neden olur. Bu nedenle göğüs ağrısı ile başvuran hastaların yönetimi oldukça önem kazanmaktadır.

**Gereç ve Yöntem:** Balıkesir Üniversitesi Tıp Fakültesi Acil Tıp Anabilim Dalı'nda yürütülen retrospektif çalışmamıza, dış bir merkezden göğüs ağrısı ön tanısı ile acil servise sevk edilen, dahil etme kriterlerini karşılayan ve 01.01.2020-31.08.2023 tarihleri arasında hastanemize başvuran tüm hastalar dahil edildi.

**Bulgular:** En fazla sevk C-rol grubu hastanelerden yapılmış olup, sevklerin çoğu 00:00-04:00 saatleri arasında olmuştur. Başvuruların hafta içi ve en sık cuma günleri olduğu gözlenmiştir. Şubat ayında en sık görülen şikayet göğüs ağrısı ve çarpıntıydı. Sevk edilen hastaların çoğunluğunun konsültasyonla hastaneye yatırıldığı ve en sık hastaneye yatışın Şubat ayında olduğu görüldü. En sık hastaneye yatışın kardiyoloji ve koroner yoğun bakımda olduğu görüldü.

**Sonuç:** Elde ettiğimiz verileri analiz ederek acil servislerdeki hizmetlerin etkin kullanımına katkıda bulunmak ve göğüs ağrısıyla sevk edilen hastaların hastane öncesi ve hastane içi yönetimine katkıda bulunmak amaçlandı.

**Anahtar Kelimeler:** Acil Tıp; Acil Tıbbi Hizmetler; Göğüs Ağrısı

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## INTRODUCTION

Chest pain represents the most prevalent symptom among patients presenting to the emergency department (ED) and emergency medical services (EMS), accounting for approximately 5-8% of all emergency admissions (Kontos and Jesse, 2000). In recent years, there has been a notable surge in the demand for pre-hospital care and ambulance referrals of patients presenting with chest pain. This situation is of critical importance in both FHC and pre-hospital FHC. As life expectancy increases and comorbidity rates rise, coupled with the ease of access to acute hospital services at any time of the day, the demand for such services is correspondingly higher. The rise in demand is a significant challenge not only in our country but also in many countries in the Western World (Lindskouid et al., 2023). Despite chest pain being the most common presenting symptom, the majority of symptoms are attributable to non-cardiac causes. This underscores the vital role of the emergency physician (EP) in rapidly and accurately diagnosing and treating life-threatening conditions such as acute coronary syndrome (ACS), pulmonary embolism (PE), and aortic dissection (Id et al., 2021) (Wolinsky, 2017). The standard approach to the evaluation of patients presenting with chest pain comprises a history, physical examination and electrocardiography (ECG) (Kontos and Jesse, 2000). Despite the fact that the examination is largely unremarkable, there are no examination findings that are sufficiently sensitive or specific to diagnose or exclude acute coronary syndrome (Bhatt, 2023). Accordingly, the current guidelines recommend the performance of an ECG upon admission (within the initial 10 minutes) and the subsequent examination of cardiac troponin (HS-cTn) values following the administration of a focused history. The risk of coronary syndrome increases with age. It is therefore important to enquire about other significant risk factors, such as hypertension and aortic dissection. Despite the existence of contemporary scoring systems designed to ascertain whether an underlying condition is of cardiovascular origin, clinical evaluation remains the optimal approach (Prendergast et al., 2010). However, it is challenging to

distinguish between ACS and other causes of chest discomfort based on clinical signs or ECG findings alone. The majority of guidelines explicitly indicate that general practitioners should promptly refer all patients with suspected ACS to higher-level healthcare organisations, or even circumvent general practitioners to prevent time-consuming delays and minimise the risk of myocardial cell necrosis. Nevertheless, while approximately 20-40% of patients with chest pain are referred for safe exclusion of ACS, only one-fifth of these referred patients have severe disease (Hoorweg et al., 2017). However, there is a paucity of knowledge in this area. The reasons behind general practitioners' decisions to refer patients with chest pain (Bruyninckx et al., 2009).

Patients are typically referred to higher-level centres from district hospitals or primary healthcare services where cardiology specialists are unable to provide effective consultations. Consequently, emergency services, which are already subject to a certain degree of congestion, are further burdened by the influx of unnecessary referrals from external centres, thereby complicating the management of the service and patients.

In this study, we conducted a case analysis of patients admitted to the emergency department with a pre-diagnosis of chest pain, with the objective of providing recommendations for more effective utilisation of emergency departments and more appropriate referrals.

## MATERIALS AND METHODS

The study was conducted retrospectively, following the approval of the ethics committee (Decision No: 2023/48, Date: 19.04.2023). A total of 759,290 patients admitted to the Balıkesir University Emergency Department with ICD R07.3 and R07.4 codes between 01/01/2020 and 31/08/2023 were included in the study. A total of 1064 patients who had been referred to the 112 Emergency Command Control Centre (CCC) and the Balıkesir University Faculty of Medicine Emergency Department by ambulance with a prediagnosis of chest pain between 01/01/2020 and 31/08/2023 were included in the study. The case

files of the patients and the 112 ambulance case delivery forms were subjected to analysis. The demographic, clinical and laboratory data of each case were obtained from the electronic database by scanning the relevant ICD codes (R07.4 and R07.3). The data set comprised demographic information (age, gender, etc.), history, physical examination findings, ECG findings, risk factors, referred role group hospital, time interval and day of referral, consultations, treatment methods applied, hospital stay and hospitalisation information. The pre-hospital patient charts and forms of patients referred to the emergency department by 112 were obtained from the hospital patient records and divided into the four categories of A, B, C and D role group hospitals according to the status of the hospital of arrival. The study population comprised patients admitted outside the dates between 01 January 2020 and 31 August 2023, patients younger than 18 years of age, outpatients, and patients who were not referred by ambulance and whose records could not be reached. These individuals were excluded from the study.

The statistical analyses were conducted using the IBM SPSS 25.0 software (SPSS for Windows, version 25.0, SPSS, Chicago, Illinois, USA). Descriptive statistics were

expressed as frequency (n), percentage (%), mean  $\pm$  standard deviation (SD) and median. A chi-square test was employed for the purpose of comparing the groups in question. The suitability of the data for normal distribution was evaluated using the Kolmogorov-Smirnov test. A p-value of less than 0.05 was considered to indicate a statistically significant result.

## RESULTS

The study included 1,064 patients. A total of 62.58% (n=666) of the patients were male, while 37.42% (n=398) were female. The mean age of the patients was 63.5 $\pm$ 15.11 years. An examination of the referrals from role group hospitals to the CHC revealed that the highest number of referrals, representing 55.92% (n=595) of the total, originated from group C hospitals (Table 1).

**Table 1. Demographic characteristics of referrals.**

Referral Group Hospital	Female n (%)	Male n (%)	Total n (%)
Group B	9 (0.85%)	15 (1.41%)	24 (2.26%)
Group C	223 (20.97%)	372 (34.95%)	595 (55.92%)
Group D	166 (15.60%)	279 (26.22%)	445 (41.82%)
<b>Total</b>	<b>398 (37.42%)</b>	<b>666 (62.58%)</b>	<b>1064 (100%)</b>

In our study, 49.15% (n=523) of the participants were over 65 years of age when age-related CHC referral rates were analysed. Upon analysis of the referral rates according to hospital groups, it was observed that patients

over 65 years of age constituted the largest proportion, with 1.22% (n=13) in group B, 26.78% (n=285) in group C, and 21.15% (n=225) in group D, irrespective of the hospital group (Table 2).

**Table 2.** Age distribution according to referral hospitals.

Hospital Group	18-45 years old Number of applications n (%)	45-65 years old Number of applications n (%)	Over 65 years old Number of applications n (%)	Total Number n (%)
Group B	1 (0.09%)	10 (0.94%)	13 (1.22%)	24 (2.26%)
Group C	64 (6.02%)	246 (23.12%)	285 (26.78%)	595 (55.92%)
Group D	57 (5.36%)	163 (15.32%)	225 (21.15%)	445(41.82%)
<b>Total</b>	<b>122 (11.47%)</b>	<b>419 (39.38%)</b>	<b>523 (49.15%)</b>	<b>1064 (100%)</b>

The distribution of referrals according to the days of the week revealed that the highest number of referrals were made on Fridays (16.54%, n=176), while the lowest number were made on Sundays (10.71%, n=114). Of the total number of referrals, 76.79% (n=817) were

made on weekdays, with the highest referral rate observed in group C hospitals, at 42.02% (n=447). The highest number of referrals was observed on Fridays (16.54%, n=176) and Wednesdays (15.41%, n=164) (Table 3).

**Table 3.** Hospital referral rates according to days.

Day	Group B n (%)	Group C n (%)	Group D n (%)	Total n (%)
Monday	1 (0.09%)	90 (8.46%)	72(6.77%)	163 (15.31%)
Tuesday	3 (0.27%)	97 (9.12%)	56 (5.26%)	156 (14.66%)
<b>Wednesday</b>	<b>5 (0.45%)</b>	<b>80 (7.52%)</b>	<b>79 (7.42%)</b>	<b>164 (15.41%)</b>
Thursday	4 (0.36%)	91 (8.55%)	63 (5.92%)	158 (14.85%)
<b>Friday</b>	<b>5 (0.45%)</b>	<b>89 (8.37%)</b>	<b>82 (7.70%)</b>	<b>176 (16.54%)</b>
Saturday	3 (0.27%)	82 (7.70%)	48 (4.51%)	133 (12.50%)
Market	3 (0.27%)	66 (6.20%)	45 (4.23%)	114 (10.71%)
<b>Total</b>	<b>24 (2.26%)</b>	<b>595 (55.92%)</b>	<b>445 (41.82%)</b>	<b>1064 (100%)</b>

In this study, the most common symptom of all referrals was chest pain with 60.33% (n=642), and 38.53% (n=410) of patients presenting with chest pain were male. The other most common referral symptoms were palpitations 21.05%

(n=224), dyspnoea 10.71% (n=114) and back pain 1.60% (n=37), respectively. The least common referral symptom was syncope with 2.26% (n=24) (Table 4).

**Table 4.** Referral rates depending on symptoms.

Symptom	Female n (%)	Male n (%)	Total n (%)
Chest pain	232 (21.80%)	410 (38.53%)	642 (60.33%)
Palpitations	90 (8.46%)	134 (12.59%)	224 (21.05%)
Dyspnoea	44 (4.14%)	70 (6.58%)	114 (10.72%)
Back pain	17 (1.60%)	20 (1.88%)	37 (3.48%)
Syncope	6 (0.57%)	18 (1.69%)	24 (2.26%)
Other	10 (0.94%)	13 (1.22%)	23 (2.16%)
<b>Total</b>	<b>399 (37.51%)</b>	<b>665 (62.49%)</b>	<b>1064 (100%)</b>

A review of hospitalisations according to the symptoms of the referrals revealed that 66.45% (n=707) of the 1064 referred patients were hospitalised in the relevant wards or intensive care units (ICU). The most common hospitalisation among the hospitalised patients was coronary ICU, accounting for 48.78% (n=345) of cases. Among those hospitalised in coronary ICU, the most common symptom was chest pain, occurring in 61.52% (n=435) of cases. A further analysis of the data revealed that the highest number of hospitalisations was in the coronary ICU, with the highest number of

hospitalisations occurring in the patient group over 65 years of age (26.87%, n=190). However, the group of patients admitted to emergency angiography was the 45-65 age group (7.36%, n=52). While 30.35% (n=323) of the patients who were referred were discharged, only 3.20% (n=34) left the hospital as a result of treatment refusal. Furthermore, an examination of the distribution of hospitalisations by month reveals that the highest rates were observed in June (7.99%, n=85), February (7.23%, n=77) and January (7.14%, n=76), respectively (Table 5-6).

**Table 5.** Distribution of hospitalised patients according to age range and branch of hospitalisation.

Hospitalisation	18-45 years old, n (%)	45-65 years old n (%)	Over 65 years old, n (%)	Total n (%)
Coronary Intensive Care	20 (2.82%)	135 (19.09%)	190 (26.87%)	345 (48.78%)
Cardiology Service	22 (3.11%)	54 (7.64%)	58 (8.20%)	134 (18.95%)
Emergency Angiography	11 (1.55%)	52 (7.36%)	48 (6.79%)	111 (15.70%)
Anaesthesia Intensive Care	1 (0.14%)	2 (0.28%)	15 (2.12%)	18 (2.54%)
Gastroenterology Service	1 (0.14%)	5 (0.7%)	2 (0.28%)	8 (1.13%)
Chest Diseases Service	0	2 (0.28%)	4 (0.56%)	6 (0.85%)
Internal Medicine Service	0	1 (0.14%)	4 (0.56%)	5 (0.70%)
Cardiovascular Surgery Intensive Care	0	1 (0.14%)	2 (0.28%)	3 (0.42%)
Transfer to Another Centre	8 (1.13%)	27 (3.81%)	42 (5.94%)	77(10.89%)
<b>Total</b>	<b>63 (8.91%)</b>	<b>279 (39.46%)</b>	<b>365 (51.63%)</b>	<b>707 (100%)</b>

**Table 6.** Hospitalisation-discharge rates of referred patients according to months.

Months	Hospitalisation n (%)	Discharged n (%)	Treatment Refusal n (%)	Total number n (%)
January	76 (7.14%)	38 (5.37%)	5 (0.47%)	119 (11.18%)
February	77 (7.23%)	30 (2.82%)	2 (0.18%)	109 (10.24%)
Mart	54 (5.07%)	32 (3.00%)	2 (0.18%)	88 (8.27%)
April	53 (4.98%)	22 (2.07%)	3 (0.27%)	78 (7.33%)
May	65 (6.12%)	27 (2.54%)	5 (0.47%)	97 (9.12%)
June	85 (7.99%)	38 (5.37%)	2 (0.18%)	125 (11.75%)
July	49 (4.60%)	33 (3.09%)	4 (0.36%)	86 (8.08%)
August	50 (4.69%)	20 (1.88%)	2 (0.18%)	72 (6.77%)
September	46 (4.32%)	20 (1.88%)	2 (0.18%)	68 (6.39%)
October	58 (5.45%)	17 (1.60%)	1 (0.09%)	76 (7.14%)
November	55 (5.17%)	26 (2.45%)	3 (0.27%)	84 (7.89%)
December	39 (3.66%)	20 (1.88%)	1 (0.09%)	60 (5.64%)
<b>Total</b>	<b>76 (7.14%)</b>	<b>38 (5.37%)</b>	<b>5 (0.47%)</b>	<b>119 (11.18%)</b>

Upon analysis of referrals by month, it became evident that the majority of referrals originated from Group C hospitals, with the highest

referral rates observed in January (11.18%, n=119) and June (11.75%, n=125) (Table 7).

**Table 7.** Distribution of hospital referrals by months

Months	Group B	Group C	Group D	Total number n (%)
<b>January</b>	<b>2 (0.18%)</b>	<b>75 (7.05%)</b>	<b>42 (3.95%)</b>	<b>119 (11.2%)</b>
February	0	66 (6.20%)	43 (4.04%)	109 (10.2%)
Mart	0	51 (4.79%)	37 (3.48%)	88 (8.3%)
April	0	46 (4.32%)	32 (3.00%)	78 (7.3%)
May	5 (0.45%)	52 (4.89%)	40 (3.76%)	97 (9.1%)
<b>June</b>	<b>4 (0.36%)</b>	<b>66 (6.20%)</b>	<b>55 (5.17%)</b>	<b>125 (11.75%)</b>
July	2 (0.18%)	48 (4.51%)	36 (3.38%)	86 (8.1%)
August	6 (0.54%)	34 (3.19%)	32 (3.00%)	72 (6.8%)
September	0	33 (3.10%)	35 (3.29%)	68 (6.4%)
October	1 (0.09%)	40 (3.76%)	35 (3.29%)	76 (7.1%)
November	1 (0.09%)	49 (4.60%)	34 (3.20%)	84 (7.9%)
December	3 (0.27%)	35 (3.29%)	24 (2.25%)	62 (5.8%)
<b>Total</b>	<b>24 (2.26%)</b>	<b>595 (55.92%)</b>	<b>445 (41.82%)</b>	<b>1064 (100%)</b>

According to the 24-hour application hours of the referred patients. 35.06% (n=373) of the referrals were made between 00:00 and 04:00. When the referrals made were divided into

working and non-working hours. 80.92% (n=861) of the referrals were made in the non-working hours (Table 8).

**Table 8.** Referral rates of hospitals according to admission hours.

Admission Time	Group B	Group C	Group D	Number of patients
<b>Between 00-04</b>	8 (0.75%)	<b>210 (19.74%)</b>	<b>155 (14.57%)</b>	<b>373 (35.06%)</b>
Between 04-08	3 (0.29%)	127 (11.94%)	83 (7.80%)	<b>213 (20.02%)</b>
08 to 12	1 (0.09%)	67 (6.30%)	60 (5.63%)	<b>128 (12.03%)</b>
12 to 16	3 (0.29%)	86 (8.08%)	42 (3.95%)	<b>131 (12.31%)</b>
16 to 20	8 (0.75%)	71 (6.67%)	70 (6.58%)	<b>149 (14.00%)</b>
20 to 24	1 (0.09%)	34 (3.19%)	35 (3.29%)	<b>70 (6.58%)</b>
<b>Total</b>	<b>24 (2.26%)</b>	<b>595 (55.92%)</b>	<b>445 (41.82%)</b>	<b>1064 (100%)</b>

When the consultation rates of the referred patients were analysed. it was seen that 95.5% (n=1016) of the referred patients were consulted to a department. The departments consulted were 86.88% (n=883) Cardiology. 9.84% (n=100) Anaesthesia and Reanimation. 1.38% (n=14) Chest Diseases. 0.89% (n=9) Gastroenterology. 0.49% (n=5) Cardiovascular Surgery and 0.49% (n=5) General Internal

Medicine (Table 9).

The most common concomitant diseases in the CV of the referred patients were coronary artery disease 58.27% (n=620). hypertension 58.08% (n=618). diabetes mellitus 44.74% (n=476). hyperlipidaemia 31.30% (n=333) and chronic renal failure 12.97% (n=138) (Table 10).

**Table 9.** Consultation rates of referred patients and the branches consulted.

Consultation	Number (%)
Positive	1016 (95.5%)
None	48 (4.5%)
<b>Total</b>	<b>1064 (100%)</b>
Consultation Branch	Number of Patients (%)
Cardiological Diseases	883 (86.88%)
Anaesthesia	100 (9.84%)
Chest Diseases	14 (1.38%)
Gastroenterology	9 (0.89%)
Cardiovascular Surgery	5 (0.49%)
General Internal Medicine	5 (0.49%)
<b>Total</b>	<b>1016 (100%)</b>

**Table 10.** Comorbidities in referred patients.

	With concomitant disease	No concomitant disease
<b>Coronary Artery Disease (CAD)</b>	620 (58.27%)	444 (41.73%)
<b>Hypertension (HT)</b>	618 (58.08%)	446 (41.92%)
<b>Diabetes Mellitus (DM)</b>	476 (44.74%)	588 (55.26%)
<b>Hyperlipidaemia</b>	333 (31.30%)	731 (68.70%)
<b>Chronic Kidney Failure (CRF)</b>	138 (12.97%)	926 (87.03%)

## DISCUSSION

Chest pain represents one of the most common reasons for admission to the emergency department. (Sağlık et al., 2024) However, there is currently no accepted, simple and adequate clinical decision-making rule for making the diagnosis and represent 2-6% of AS admissions and 20% of hospitalisations (Fass and Dickman, 2006). The majority of these hospitalisations necessitate risk assessment and measurement of cardiac biomarkers for a potential diagnosis of acute coronary syndrome (ACS) (Sweeney et al., 2020). It is assumed that all patients presenting with suspected chest pain have a cardiac aetiology, and the majority are conveyed to emergency departments to exclude the possibility of acute coronary syndrome. The result of these admissions is an overcrowded emergency department, an increase in the number of patients transferred by ambulance, and a problematic rise in

healthcare costs (Backus et al., n.d.). Ischemic heart disease, coronary artery disease and ischemic brain disease are less prevalent in provinces with a geographically high elderly population, such as Balıkesir, where our study was conducted. However, failure to identify the underlying cause in patients presenting with chest pain can result in significant morbidity and mortality. Consequently, the management of these patients is of paramount importance. Patients admitted to centres in the B, C and D groups, which were the focus of our study, are referred to our hospital for differential diagnosis and further investigation and treatment.

In accordance with the existing literature, our study revealed that the most common referrals were male gender and patients over 65 years of age (Özen et al., 2012).

Upon analysing the distribution of referral times in our study, it was found that the majority (80.92%) of referrals were made

outside of regular working hours, with emergency department referrals being more frequent on weekdays. The highest referral rate was observed on Friday, while Sunday exhibited the lowest referral rate. Upon analysis of the referral data according to arrival times, it was observed that the interval between 00:00 and 04:00 exhibited the highest referral rate, at 35.06%. C-grade group hospitals have the highest referral rate of 19.74% within the specified time interval. In contrast to our study, the investigation conducted by Burt et al. revealed that 112 ambulance arrivals occurred between 10:00 and 13:00, with the highest number of transfers taking place on Mondays (Burt et al., 2006). In the literature; it was observed that the number of ambulance referrals was higher on Saturdays, with the majority of applications received between 09:00 and 16:00 (Deniz et al., n.d.). The discrepancy between the results of our study and those of previous research is thought to be due to socioeconomic and geographical differences. Upon analysis of the number and percentage of referrals, significant fluctuations were observed in certain months. The highest referral rates were observed in January (11.2%) and June (11.7%). The elevated referral rate observed in January can be attributed to an increase in respiratory diseases, accidents resulting from cold weather conditions, and other winter illnesses. The observed increase in June, the start of the summer season, may be attributed to the combination of hot weather conditions, increased outdoor activities and a potential rise in accidents.

In the present study, the most common reasons for hospitalisation were chest pain and palpitations. This finding is consistent with the existing literature and demonstrates that these referrals were made in accordance with the intended purpose and necessity. The majority of patients were admitted to the cardiology service or coronary intensive care unit. Furthermore, the fact that 9.62% of the patients were admitted for emergency angiography demonstrates that 24-hour

angiography can be performed in our hospital and that invasive interventions for diagnosis and treatment are widely utilised. In a similar vein, found that patients presenting with a prediagnosis of chest pain were mostly diagnosed with ACS, followed by pulmonary diseases and somatisation disorders (Knockaert et al., 2002).

A review of hospitalisation data reveals that the majority of patients admitted with various symptoms are concentrated in elderly populations. Of note, patients aged 65 and above have the highest rate of hospitalisation, accounting for 51.63% of total admissions (Carubbi et al., n.d.).

In our study, it was observed that the majority of hospitalisations occurred in the cardiology department, with the highest rate of hospitalisation observed in patients aged 65 years and over (51.63%). These findings align with existing literature, indicating that cardiovascular and other health issues tend to become more prevalent with advancing age (Aygun et al., n.d.). In another study, evaluating patients presenting to the emergency department with chest pain, the mean age was 72.3 years (Carubbi et al., n.d.). The prevalence of cardiovascular disease in the elderly population underscores the necessity for their hospitalisation in either general wards or coronary intensive care units due to the severity of their conditions. It can be observed that a greater proportion of elderly patients are hospitalised in coronary intensive care and cardiology services. Furthermore, it can be posited that the majority of referrals and hospitalisations in this demographic are a result of cardiovascular symptoms that increase with age.

Upon analysis of the hospitalisation data of patients following referral, it was observed that male patients were hospitalised at a higher rate, with a percentage of 64.52%. It has been observed that male patients are hospitalised with greater frequency due to cardiovascular issues. In our study, the majority of patients who were referred were

seen in the cardiology department. the majority were hospitalised by cardiology. and emergency angiography was performed in 16.75% of hospitalisations. However. the study conducted by Ertan et al. revealed that the distribution of patient referrals according to the days of the week was Friday. Sunday and Saturday. respectively (Ertan et al., 2010). This may be attributed to the fact that the consultant physician in the referring hospital opted to refrain from hospitalising patients at the weekend. which may explain the observed increase in referrals prior to the weekend.

Upon examination of the distribution of referrals according to risk factors. it was observed that patients with coronary artery disease and hypertension were more frequently referred to the emergency department of our hospital. Patients presenting to the emergency department with chest pain. it was observed that the most common comorbidity was coronary artery disease. occurring in 34% of cases (Al-Lamee et al., n.d.). It is essential to obtain comprehensive information regarding predisposing diseases. family history. lifestyle. and drug use. Patients are frequently unable to provide comprehensive information about their diagnosed diseases and often provide inconsistent responses. Hypertension and diabetes mellitus are associated with an unfavourable clinical prognosis. In light of the findings of our study and those of other studies in the literature. it can be posited that hypertension and diabetes mellitus play a significant role in the aetiology of acute coronary syndrome (ACS) (Özel Coşkun et al., 2015).

In our study. 95.5% of referrals were requested for consultation by the emergency physician. with 66.52% resulting in hospitalisation. The rate of patients who were discharged from the hospital was 30.55%. while the rate of patients who refused treatment was 3.10%. The months with the highest rates of hospitalisation were June (7.99%). February (7.24%) and January (7.14%). The high rate of hospitalisations among referred patients indicates that the

referrals were made in accordance with the relevant clinical indications. Upon analysis of the consultations requested during the diagnosis and treatment phase of the patients. it was observed that the majority of these consultations were made to the cardiology department (86.88%). The rate of anaesthesia consultations was 9.84%. indicating that the patients required intensive care. underlying causes and surgical intervention. These findings underscore the prevalence of cardiovascular issues and the significance of accurate referrals. The analysis of referral processes and outcomes is of critical importance for the improvement of patient care quality and the evaluation of emergency departments' effectiveness.

## CONCLUSION

The findings of this study indicate that elderly patients were referred at a high rate across all hospital groups. This situation demonstrates that the elderly population requires greater access to health services. with 112 ambulance services being the primary means of transportation for elderly patients. It was demonstrated that the specific requirements of the elderly population must be taken into account in the planning of health services. Furthermore. it is essential to develop targeted strategies to enhance the accessibility and utilisation of health services among the elderly population.

It is hypothesised that the referral rate of patients is elevated due to the dearth of physicians and personnel in the district state hospitals of Balıkesir province. where the study was conducted. It is anticipated that patients are not inclined to be followed up. particularly outside of normal working hours. Furthermore. referrals are frequently initiated without an appropriate indication. based on the patient's complaint. and sometimes even before examination results are available. This situation results in an increased workload for the Balıkesir University emergency department. as is the case for the majority of hospitals. The high referral rate outside of

working hours underscores the necessity for emergency departments to operate at full capacity during these hours. Fluctuations in patient admissions during the day and variability in the number of referrals necessitate flexible and dynamic staff planning.

In centres where the 112 command control centre is contacted and a referral request is made for various cardiac complaints or for the need for a specialist, the employment of emergency medicine specialists in the referral units of the 112 command control centres will prevent unnecessary referrals and enable the 112 service to reach more urgent cases more easily. This will also have a positive impact on the national economy.

In conclusion, it is essential to enhance the capacity of health services, to be prepared for emergencies and to implement the necessary measures during periods of high referral rates. These findings are of critical importance in terms of improving the quality of healthcare services and evaluating the effectiveness of emergency services.

#### **Author Contributions**

Planing and design: RK, MF; Material, methods and data collection: MF, RK; Data analysis and comments: RK, SS; Writing and corrections: BÇ, MF.

#### **Conflict of Interest**

The author declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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#### **Ethics approval and consent to participate:**

This Project was approved by the Ethics Committee in Balıkesir University Hospital on April 19, 2023 (protocol number 2023/48). The study was conducted in line with the principles of the "Helsinki Declaration."

## REFERENCES

- Al-Lamee RK, N. A. (2019). Percutaneous coronary intervention for stable coronary artery disease. *Heart*, 105(1), 11-19.
- Aygun E, A. S. (2020). Aetiological evaluation of chest pain in childhood and adolescence. *Cardiology in the Young*, 30(5), 1-7.
- Backusa B.E., T. R. (2020). The new era of chest pain evaluation in the Netherlands. *European Journal of Emergency Medicine*, 27(4), 243–244.
- Beatrijs Bn Hoorweg, R. T. (2017). Frequency of chest pain in primary care, diagnostic tests performed and final diagnoses. *Heart*, 103(21), 1727-1732.
- Bonow R, M. D. (2018). Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine, Approach to the Patient with Chest Pain. *Eleventh Edition ed. Elsevier*.
- Burt C.W., M. L. (2006). Analysis of Ambulance Transports and Diversions Among US Emergency Departments. *Annals of Emergency Medicine*, 47(4), 317-326.
- Bhatt D. L. (2023). Cardiovascular Intervention E-Book (2d Edition): A Companion to Braunwald's Heart Disease.
- Carubbi, C. M. (2019). Combination of Platelet expression of PKCepsilon and cardiac troponin-I for early diagnosis of chest pain patients in the emergency department. *Scientific Reports*, 9(1), 2125.
- Coşkun S. Ö., D. V. (2015). Acil Servise Göğüs Ağrısı İle Başvuran Hastaların Akut Koroner Sendrom Oranlarının Değerlendirilmesi. *İzmir Eğitim ve Araştırma Hastanesi Tıp Dergisi*, 19(2), 84-94.
- Deniz A.T., D. A. (2020). Analysis Of Patients Admitted To A University Hospital Emergency Room With 112. *Medical Journal of Süleyman Demirel University*, 27(2), 192-198
- Ertan, C. A. (2010). Bir üniversite hastanesi acil servisine yapılan sevklerin incelenmesi. *Türkiye Acil Tıp Dergisi*, 10(2), 65-70.
- Fass R, D. R. (2006). Non-cardiac chest pain: an update. *Neurogastroenterol Motil*, 18(6), 408-17.
- Id. J. S.. Lu. J.. Goudie. A.. Bennamoun. M.. Sprivulis. P.. Sanfillipo. F.. and Dwivediid. G. (2021). Applications of machine learning to undifferentiated chest pain in the emergency department: A systematic review. *Journals.Plos*. 16(8)
- Jonathon Stewart, J. L. (2021). Applications of machine learning to undifferentiated chest pain in the emergency department: A systematic review. *PLoS One*, 16, 8.
- Knockaert, D. B. (2002). Chest pain in the emergency department: the broad spectrum of causes, *European Journal of Emergency Medicine*, 9(1), 25-30.
- Kontos M.C., J. R. (2000). Evulation of the emergency departman chest pain patient. *The American Journal of Cardiology*, 85(5), 32-39.
- McCaig LF, B. C. (2004). National Hospital Ambulatory Medical Care Survey: 2002 emergency department summary. *Adv Data*, 340, 1-34.
- Özen, M. S. (2012). Acil Servise Başvuran Akut Koroner Sendrom Tanılı Hastaların Sosyodemografik ve Klinik Özellikleri. *Turkish Journal of Emergency Medicine*, 3.
- Rudi Bruyninckx, A. V. (2009). GPs' reasons for referral of patients with chest pain: a qualitative study. *BMC Fam Pract.*, 10, 55.
- Sweeney M., S. S. (2020). The impact of an acute chest pain pathway on the investigation and management of cardiac chest pain. *Future healthcare Journals*, 10(1), 53-59.
- Tim Alex Lindskou, P. J. (2023). More emergency patients presenting with chest pain. *PLoS One*. 18(3).
- Wolinsky, D. (2017). Imaging for chest pain in the emergency room: Finding the right gate not the right gatekeeper. *Journal of Nuclear Cardiology*, 24, 2012-4.