

## Characteristics and Gender-Related Differences of Patients Admitted to a Large Intensive Cardiac Care Unit: A Single-Center Experience with over 55 000 Patients

Büyük Bir Kardiyoloji Yoğun Bakım Ünitesine Kabul Edilen Hastaların Özellikleri ve Cinsiyete Bağlı Farklılıkları: 55 000'den Fazla Hasta ile Tek Merkez Deneyimi

### ABSTRACT

**Objective:** Parallel to the aging of the world population, the complexity of patients with cardiac problems has increased, especially in intensive cardiology care units, and the importance of multidisciplinary care has become more evident. The aim of this study was to analyze the clinical characteristics and gender-related differences of patients hospitalized in a large intensive cardiology care unit.

**Methods:** This single-center, retrospective, cross-sectional study includes all hospitalizations in a large intensive cardiology care unit between January 2016 and March 2021. All data were obtained using data collection software and transferred to MEDULLA, Turkey's general database system.

**Results:** Of the 55 737 consecutive patients included in the analysis, 16342 (29%) were women. The mean age of males was  $59.71 \pm 12$  years, and the mean age of females was  $63.3 \pm 14$  years ( $P < .001$ ). Over a period of 5 years, the most common reason for hospitalization in the intensive cardiac care unit was acute coronary syndrome. The number of acute coronary syndrome patients who underwent coronary angiography was found to be 17 478 (31%), of which 12 878 were males and 26.3% were female. The number of patients who underwent at least 1 stent implantation was 13 952 (80% of coronary angiography procedures), and 2960 (21%) were women. The second cause of hospitalization in the intensive cardiology care unit was arrhythmias (5654 patients [10%]) followed by advanced heart failure (932 patients [1.7%]). During follow-up in the intensive cardiology care unit, the percentage of development of multiorgan failure was found to be approximately 18%. The mortality rate was 7% in women, which was higher than in men (4%). While the most common cause of death was acute coronary syndrome, the highest rate of death was found in patients with advanced heart failure. Among the patients who died, the mean age of females was higher than that of males, and the length of hospital stay was longer.

**Conclusion:** Although numerically the highest death rate was observed in male acute coronary syndrome patients, the highest mortality rate was found in patients with advanced heart failure. Due to the elderly population and the increase in the number of patients requiring multidisciplinary treatment, the development of multiorgan failure in intensive cardiology care units seems to be one of the most important causes of death. Although the number of females hospitalized in the intensive cardiology care unit is lower than that of males, the mean age and mortality rate were found to be higher than males.

**Keywords:** Cardiac diseases, critical care, intensive cardiac care unit, length of stay, mortality


### ÖZET

**Amaç:** Dünya nüfusunun yaşlanmasına paralel olarak kalp hastalıklarının karmaşıklığı artmış ve özellikle kardiyoloji yoğun bakım ünitelerinde multidisipliner bakıma önemi daha da belirgin hale gelmiştir. Bu çalışmanın amacı, büyük bir kardiyoloji yoğun bakım ünitesine yatırılan hastaların klinik özelliklerini ve cinsiyete bağlı farklılıklarını analiz etmektir.

**Yöntemler:** Bu tek merkezli, geriye dönük, kesitsel çalışma, Ocak 2016 ile Mart 2021 tarihleri arasında merkezimizin kardiyoloji yoğun bakım ünitesine yapılan tüm yatışları içermektedir. Tüm veriler veri toplama yazılımı kullanılarak elde edilmiş ve Türkiye'nin genel veri tabanı sistemi olan MEDULLA'ya aktarılmıştır.

### ORIGINAL ARTICLE KLİNİK ÇALIŞMA

Şeyhmus Külahçioğlu, M.D.<sup>1</sup> 

Rezzan Deniz Acar, M.D.<sup>1</sup> 

Servet İzci, M.D.<sup>1</sup> 

Durmuş Demir, M.D.<sup>1</sup> 

Sibel Doğan Kaya, M.D.<sup>2</sup> 

Mustafa Emre Gürcü, M.D.<sup>3</sup> 

Murat Gücün, M.D.<sup>4</sup> 

Mehmet Kaan Kırallı, M.D.<sup>5</sup> 

<sup>1</sup>Department of Cardiology, Kartal Koşuyolu Education and Research Hospital, İstanbul, Turkey

<sup>2</sup>Department of Infectious Diseases, Kartal Koşuyolu Education and Research Hospital, İstanbul, Turkey

<sup>3</sup>Department of Anesthesiology, Kartal Koşuyolu Education and Research Hospital, İstanbul, Turkey

<sup>4</sup>Department of Nephrology, Kartal Koşuyolu Education and Research Hospital, İstanbul, Turkey

<sup>5</sup>Department of Cardiovascular Surgery, Kartal Koşuyolu Education and Research Hospital, İstanbul, Turkey

### Corresponding author:

Şeyhmus Külahçioğlu  
✉ drseyhmus@yahoo.com

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**Bulgular:** Yaklaşık 5 yıllık bir süre boyunca toplam 55 737 hasta analiz edildi. Bu hastaların 39 395'i erkek ve 16 342'si (%29) kadındı. Erkek hastaların yaş ortalaması  $59,71 \pm 12$  yıl, kadın hastaların yaş ortalaması  $63,3 \pm 14$  yıldır ( $P < ,001$ ). Yoğun bakım ünitesine en sık yatırılma sebebi akut koroner sendrom olarak tespit edildi ve koroner anjiyografi yapılan hasta sayısı 12 878 tanesi erkek hasta olmak üzere toplam 17 478 (%31) olarak bulundu. Kardiyoloji yoğun bakım ünitesine yatırılan hastaların ikinci sıklıkta 5654 hasta ile aritmi hastaları olduğu gözlemlendi. Kardiyoloji yoğun bakım ünitesinde takip esnasında çoklu organ yetersizliği gelişme yüzdesi yaklaşık %18 olarak saptandı. Erkek hastalarda ölüm oranı %4 iken, kadın hastalarda ölüm oranı daha yüksekti (%7). En fazla ölüm sebebi akut koroner sendrom olarak karşımıza çıkarken, en yüksek ölüm sıklığı akut kalp yetersizliği hastalarında saptandı. Ölen hastalar arasında kadın bireylerin yaş ortalaması erkek hastalara göre daha yüksek ve hastanede yatış süreleri daha uzun olarak bulundu.

**Sonuç:** Yoğun bakım ünitemizde en fazla ölüm akut koroner sendrom ile başvuran erkek hastalarda olmasına rağmen, en yüksek ölüm oranı ileri kalp yetersizliği mevcut olan hastalarda saptanmıştır. Ayrıca yaşlı nüfus ve buna paralel multidisipliner tedavi gereken hasta sayısındaki artış sebebiyle, kardiyoloji yoğun bakım ünitesinde çoklu organ yetersizliği gelişimi en önemli ölüm nedenlerinden biri olarak görünmektedir. Kardiyoloji yoğun bakım ünitesinde yatan kadın hasta sayısı erkek bireylere göre daha düşük olmasına rağmen yaş ortalaması ve ölüm oranı erkeklerle göre daha yüksek bulunmuştur.

**Anahtar Kelimeler:** Kalp hastalıkları, kardiyoloji yoğun bakım ünitesi, mortalite, yoğun bakım kalış süresi

Although the coronary care units were originally established to treat patients with the acute coronary syndrome (ACS), their outlook has changed dramatically with the evolution of complex procedures and newer technologies. Since their emergence in the 1960s, coronary care units have been transformed into intensive cardiac care units (ICCU) that provide comprehensive critical care for patients with cardiovascular diseases.<sup>1</sup> As the complexity of the patients and diseases increases, the importance of multidisciplinary care became more prominent, and incredible progress has been made in ICCUs in the past 50 years, resembling general intensive care units (ICUs).<sup>2,3</sup> Today, advancements in ICCUs and improvements in experience with a higher volume of complicated patients made it possible to treat even the diseases previously considered terminal.<sup>4,5</sup>

It is a fact that complications most applicable to critically ill cardiovascular patients may not be well represented in general ICUs. Managements in the ICCU include advanced therapies, such as invasive medical devices for hemodynamic monitoring, endotracheal intubation, continuous renal-replacement therapy (CRRT), and short-term mechanical support with an intra-aortic balloon pump, and/or extracorporeal membrane oxygenation (ECMO). Nevertheless, most critically ill patients with cardiovascular diseases have increased mortality and morbidity, and they often experience longer hospital stays.<sup>6,7</sup>

## ABBREVIATIONS

ACS	Acute coronary syndrome
ASD	Atrial septal defect
AMI	Acute myocardial infarction
CAG	Coronary angiography
CPR	Cardiopulmonary resuscitation
CRRT	Continuous renal-replacement therapy
CS	Cardiogenic shock
ECMO	Extracorporeal membrane oxygenation
ICCU	Intensive cardiac care units
ICUs	Intensive care units
IABP	Intra-aortic balloon pump
n	Number
OOH	Out-of-hospital
PA	Posteroanterior
PFO	Patent foramen ovale
PCI	Percutaneous coronary intervention
TAVI	Transcatheter aortic valve intervention
VSD	Ventricular septal defect

The number of advanced ICCUs with a large volume is relatively small in Turkey, and ICUs usually provide general intensive care. To the best of our knowledge, this study is the first analysis of the diagnoses, outcomes, and sex-related differences of patients admitted to the ICCU, the number of which is been increasing year by year in our country.

## Methods

Kartal Koşuyolu High Specialization Training and Research Hospital has 2 ICCUs with a total bed capacity of 44, arranged to simultaneously monitor 16 endotracheal intubated patients on mechanical ventilator support and 10 CRRT patients. All admissions to the ICCUs between January 2016 and March 2021 were identified and analyzed. Admissions for postoperative management after cardiac surgery were excluded from the analysis. Although the majority of the patients were interned through the emergency department, the ICCU patient population comprised patients who were hospitalized for general follow-up after undergoing advanced interventional procedures or whose condition worsened while undergoing treatment in the related services or peripheral hospitals.

All patients admitted to the ICCU were monitored immediately, blood samples were taken for detailed laboratory tests, and a posteroanterior (PA) chest x-ray was performed. Patients with acute myocardial infarction (AMI) or who had undergone successful cardiopulmonary resuscitation (CPR) were initially taken to the cardiac catheterization laboratory to undergo coronary angiography (CAG), and if necessary, stent implantation before transference to intensive care. Patients were transferred to the relevant service beds before discharge after fulfillment of their follow-up needs in the ICCU.

Cardiology specialists are the primary ICCU staff in our hospital. Anesthesiologists, internal medicine specialists, infectious disease specialists, pulmonologists, and neurologists work as consultant doctors on daily visits.

All information about patients admitted to our hospital is stored in data collection software and transferred to Turkey's general database system, namely, MEDULLA. This study was approved by the medical ethics committee of Kartal Koşuyolu Education and Research Hospital (October 05, 2021, approval number: 2021/13/515).

### Statistical Analysis

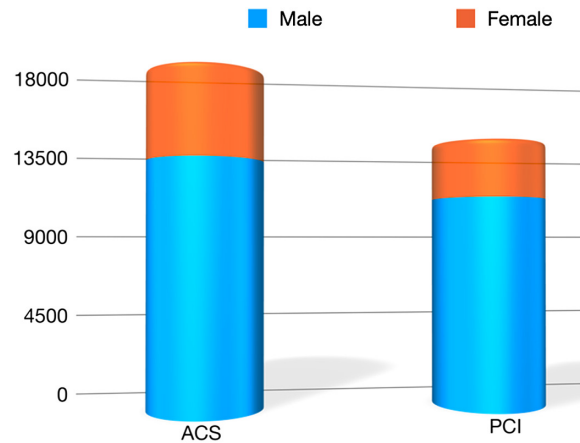
Normally distributed data are presented as mean  $\pm$  standard deviation, non-normally distributed variables as median (interquartile range), and categorical variables as percentages.

Univariate comparisons between groups were performed using the chi-square test for categorical variables and Student's *t*-test or Mann-Whitney rank-sum test for continuous variables, as appropriate. For all statistical analyses, we used R-software v. 4.02 (Vienna, Austria). Statistical significance was set at  $P < .05$ .

### Results

A total of 55 737 patients were analyzed for over a period of approximately 5 years. Recurrent hospitalizations occurred in 13 876 (2.48%) of these patients. Of the total study group, 39 395 (70.68%) were men and 16 342 were women. The mean age of the males and females was  $59.71 \pm 12$  (18-102) and  $63.34 \pm 14$  (18-98) years, respectively. The percentage of patients older than 65 years was significantly higher among women compared to men (48.6% vs 35.2%, respectively,  $P < .001$ ).

The number of patients admitted with ACS who underwent CAG was 17 478 (31.35%); 12 878 (73.68%) were men and 4600 were women (Table 1). The mean age was 58.12 and 63.67 years for men and women, respectively. The number of patients who underwent at least 1 stent implantation procedure was 13 952 (80% of CAG procedures), and 2960 of these patients were



**Figure 1. The number of patients admitted with acute coronary syndrome (ACS) who underwent percutaneous coronary intervention by sex.**

women and 10 992 (78.78%) of them were men (Figure 1). Among these patients, the mean age was 58.91 and 65.98 years for men and women, respectively.

Among the patients who underwent peripheral arterial intervention, the number of patients requiring intensive care after carotid artery stent implantation was 94, of whom 51 were men.

The number of patients who underwent peripheral-artery intervention requiring intensive care was 1001, and the majority of these patients were men ( $n=798$ , 79%), as expected.

Thrombolytic therapy was administered to 297 patients, 159 (53.53%) of whom were women. The number of patients with obstructive mechanical prosthetic valve thrombus who underwent thrombolytic therapy was 50 and 44 of them were successfully treated.

Among the patients who underwent interventional procedures for structural heart diseases, the percentage of women was higher than men. Urgent transcatheter aortic valve implantation (TAVI) was performed in 35 patients, 23 of whom were women (66%). During the TAVI procedure, 2 of the patients died and 1 of them was a man. Atrial septal defect/patent foramen ovale closure was performed in 544 patients, of whom 342 were women (63%). The number of ventricular septal defect closures was 50 and 29 of them were performed in women (58%).

Continuous renal-replacement therapy including ultrafiltration and repeated hemodialysis was required for 10 291 patients (18.46%) among those followed up in the ICCU. Some patients underwent ultrafiltration, whereas others underwent repeated hemodialysis. Most of the procedures were performed on males ( $n=7013$ , 68%).

The total number of used red blood cell transfusion products was 3181, that of plasma products was 784, and that of platelets was 172.

A total of 932 patients with advanced heart failure (HF) were admitted to the ICCU, of whom 625 were men (67%) (Table 2). Among these patients, the mean age was 63.93 and 68 years for

**Table 1. The Frequencies of Invasive and Non-invasive Interventions Performed in the ICCU According to Gender**

Procedures	Total (n)	Male (n)	Female (n)
Coronary angiography	17 478 (40%)	12 878 (74%)	4600 (26%)
Percutaneous coronary interventions	13 952 (80%)	10 992 (78%)	2960 (22%)
Peripheral artery interventions	1001	798 (79%)	203 (21%)
Carotid stent	94	51 (54%)	43 (56%)
TAVI	35	23 (66%)	12 (34%)
ASD/PFO closure	544	342 (63%)	202 (37%)
VSD closure	50	21 (42%)	29 (58%)
ECMO	67	42 (62%)	25 (38%)
IABP	97	64 (65%)	33 (36%)
Endotracheal intubation	1987	1116 (56%)	871 (44%)
CPR	4117 (7.3 %)	2357 (57%)	1760 (43%)
Pericardiocentesis	1476	765 (52%)	711 (48%)
Thoracentesis	157	76 (48%)	81 (52%)
Renal replacement therapy	10 291	7013 (68%)	3278 (32%)

n, number; TAVI, transcatheter aortic valve intervention; ASD, atrial septal defect; PFO, patent foramen ovale; VSD, ventricular septal defect, ECMO, extracorporeal membrane oxygenation; IABP, intra-aortic balloon pump; CPR, cardiopulmonary resuscitation; ICCU, intensive cardiac care unit.

**Table 2. The Frequencies of Other Diagnoses Among Patients Admitted to the ICCU According to Gender**

n= 55 737	Total (n)	Male (n)	Female (n)
Heart failure	932 (1.6%)	625 (67%)	307 (33%)
Severe acute myocarditis	50	40 (80%)	10 (20%)
Acute CS	15	12 (80%)	3 (20%)
Pulmonary emboli	530	218 (41%)	312 (59%)
Pulmonary hypertension	164	50 (30%)	114 (70%)
Cardiac arrest (OOH)	528	351 (66%)	177 (44%)
Death	2839 (5%)	1638 (57%)	1201 (47%)

n, number; CS, cardiogenic shock; OOH, out-of-hospital; ICCU, intensive cardiac care unit.

males and females, respectively ( $P=.002$ ). Intra-aortic balloon pump was inserted in 97 patients, 64 of them were men (65%). Extracorporeal membrane oxygenation was performed in 67 patients, of whom 25 were women (37%). Twelve males and 3 females were admitted with acute cardiogenic shock. Despite the weaning rate from ECMO being 59%, the discharge rate of these patients from the hospital without any neurological sequelae was 36%. Approximately 50 patients were admitted to the ICCU for severe acute myocarditis, and most of them were men (80%).

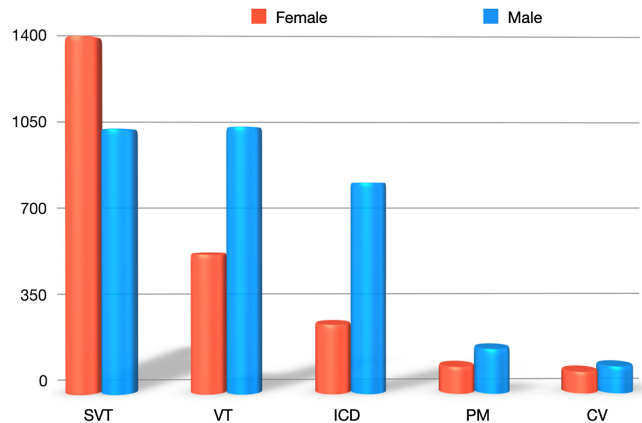
Acute pulmonary embolism was encountered in 530 patients, most of whom were women ( $n=312$ , 58%). The mortality rate due to pulmonary embolism was 6.5% for women and 5.5% for men. The number of patients with pulmonary hypertension was 164, and 114 of them were women (69%). Among these patients, the mortality rate was also high; 17% for women and 10% for men.

On evaluating the minor surgical procedures, the number of pericardiocentesis cases was found to be 1476, and 765 of them were male. Further, thoracentesis was also performed in 157 patients, of whom 81 were women.

The number of planned cardioversions under anesthesia for atrial fibrillation or flutter was 1536, of which 1008 were performed on men (65%). The number of patients ablated for supraventricular tachycardia was 2348 and 1348 of these patients were women (57%). The number of ablation procedures performed due to ventricular tachycardia or frequent ventricular extrasystole was 272 and 170 of these were performed on males (62%).

The number of patients admitted with an atrioventricular block was 437, of which 230 were women. However, pacemaker implantation was performed in 182 patients, 102 of whom were men (56%). The number of patients who underwent implantable cardioverter-defibrillator (ICD) implantation was considerably higher, that is, 1061 patients and 798 of these patients were men (75%; Figure 2).

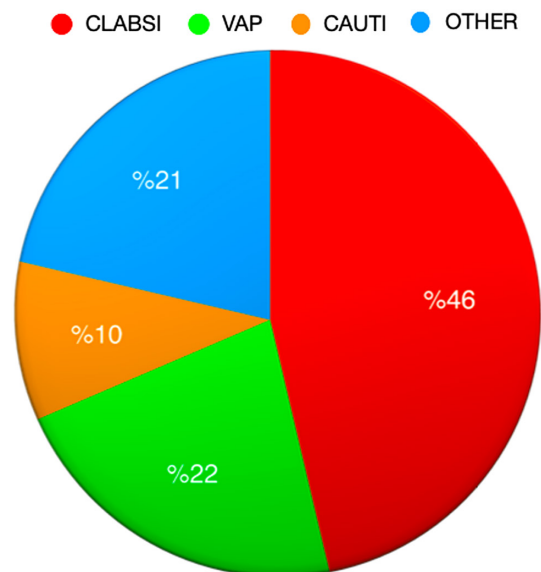
While the rate of infection among males in our ICCU was 0.18%, it was 0.46% among females. The most common cause was central line-associated bloodstream infection, followed by ventilator-associated pneumonia and catheter-associated urinary tract infection (Figure 3). *Klebsiella* spp. pneumonia was the most



**Figure 2. The number of patients who underwent catheter ablation for supraventricular tachycardia, including atrial fibrillation, ventricular tachycardia, implantable cardioverter defibrillator, pacemaker implantation, and cardioversion due to atrial fibrillation.**

frequently detected infection (20%), followed by *Acinetobacter baumani* (18%) and *Staphylococcus aureus* (14%) in patients who required follow-up care in the ICCU.

The average length of stay was 1.7 and 2.3 days for males and females, respectively. The maximum length of stay was 86 and 131 days for females and males who eventually died, respectively. The number of patients undergoing CPR was 4117 (7.38%), among whom 2350 were men. The number of patients who underwent elective endotracheal intubation was 1987 (3.56%) and 1116 of these patients were men. Out-of-hospital cardiac arrest incidence was seen in 528 and it mostly affected males ( $n=351$ , 66%). A total of 2839 (5.09%) patients died, among whom 1201 (42 %) were women. Among the deceased,

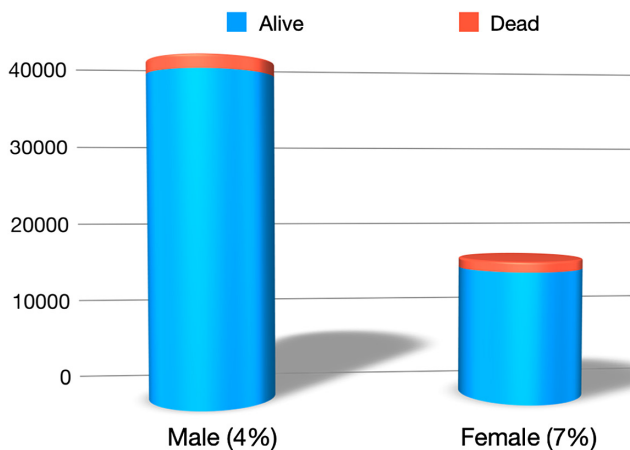


**Figure 3. The percentages of the infection types among patients in the ICCU. CLABSI, central line-associated bloodstream infection; VAP, ventilator-associated pneumonia; CAUTI, catheter-associated urinary tract infection.**

**Table 3. Age Comparison of Patients Admitted to the ICCU According to Gender**

	Female (n=16342)	Male (n=39395)	P
Age (years)	63 ± 14	59 ± 12	.000
Hospitalization (days)	2.3 (0-131)	1.7 (0-86)	.000
Mortality age (years)	73 ± 14	67 ± 13	.000
ACS age (years)	63 ± 12	58 ± 11	.000
PCI age (years)	65 ± 11	58 ± 11	.000
Heart failure (years)	68 ± 15	63 ± 13	.002

n, number; ACS, acute coronary syndrome; PCI, percutaneous coronary intervention; ICCU, intensive cardiac care unit.

**Figure 4. The percentage of mortality of patients according to gender.****Table 4. The Major Causes and Mortality Rates of Patients Admitted to the ICCU According to Gender**

n = 55 737	Total (n)	Male (n)	Female (n)	Mortality Rate (m)	Mortality Rate (f)
ACS	19 151 (34%)	14 118 (73%)	5033 (27%)	5.9%	6.07%
MOF	10 032 (18%)	5819 (58%)	4213 (42%)	9.6%	18%
AHF	1111 (2%)	743 (67%)	368 (33%)	22%	21%
Arrhythmias	5654 (10%)	3183 (56%)	2471 (44%)	<1%	<1%
Other	19 789 (36%)	15 532 (79%)	4257 (21%)	<1%	<1%

n, number; ACS, acute coronary syndrome; MOF, more than 1 organ failure; AHF, advanced heart failure; arrhythmias, total number of the patients admitted to the ICCU due to any cause of arrhythmia; ICCU, intensive cardiac care unit; other, total number of the patients admitted to ICCU for other causes.

the mean age was 67.21 and 73.07 years for men and women, respectively (Table 3). The total mortality rate for males admitted to our ICCU was 4%, whereas that was higher in females (7%) (Figure 4).

Although in patients who underwent CAG and stent implantation, procedure-related deaths were infrequent (0.96%), 59 of 135 patients (43.7%) who died during invasive procedures were women (Table 4). The procedure-related mortality rate was 2% for women, while it was 0.7% for men but the overall mortality rate due to ACS was similar between both genders. The mortality rate of the patients with advanced HF was quite high and no significant difference was found between men and women (22% vs 21%, respectively). Although the number of patients with advanced HF was lower than the patients with ACS, this group has the highest mortality rates (Table 4).

## Discussion

In our study, we aimed to analyze the main demographic characteristics of the patients admitted to our ICCU. The majority of the patients were those who underwent CAG for ACS. Among these patients, men made up the overwhelming majority. Considering the number of patients who needed to be followed in the ICCU for ACS, males were approximately 3 times more than the females; moreover, they were younger and had the highest number of deaths in our ICCU.

Stent implantation procedures were performed in the same or consecutive sessions in the majority of patients with ACS and underwent CAG. When the female ACS patients who underwent CAG were specifically examined, it was seen that there was a lower need for stent implantation compared to men, although their mortality rate was higher. This result was in line with other reported data. According to datasets from the American College of Cardiology-National Cardiovascular Data Registry, the British Society for Cardiovascular Intervention, and the Swedish Coronary Angiography and Angioplasty Registry, women with ACS had less obstructive disease; however, paradoxically, the in-hospital and 1-year mortality rates were much higher.<sup>8,9</sup>

According to Myocardial Infarction Research Units, the mortality rate was reported to be quite high in the range of 25%-35% in the 1960s.<sup>10</sup> Again, according to a report from Urban New York City hospitals, ACS was the main diagnosis for intensive care unit admission, which is consistent with our research results.<sup>11</sup> As intensive care units developed over time and as a result of advances in the medical community, death rates due to ACS gradually decreased. Duke and North Carolina University Hospitals reported a mortality rate of 7%-8% for patients followed up with the diagnosis of ACS, similar to the values we found in our study (6%).<sup>12</sup> We would like to emphasize that when we evaluated our patients followed in ICCU with this study, we realized that women need intensive care at a later age, but the death rate is quite high when compared to men. As a result, we may assume that serious heart diseases are less common but more fatal in women and that it is more likely to be encountered at older ages in our ICCU.

Considering the ICCU hospitalization times of the patients, we found that although the number of males who needed intensive care was higher than females, the ICCU hospitalization period of females was longer. Despite the fact that men are the majority in ICCUs, their hospitalization rate was higher, and although there were fewer hospitalizations reported in women, the duration of ICCU requirements was longer. In addition, the number of patients who underwent endotracheal intubation was higher in men, but the mechanical ventilation rate was lower, that is, they were extubated faster than females. The reason for this result can be explained by predicting that females needed ICCU at later ages and the presence of possible comorbid diseases.

It is known that advanced age and the presence of concomitant diseases are very important factors for mortality.<sup>13</sup> It has been reported that increased length of stay in hospital is associated with multiple organ failure and, consequently, a worse prognosis.<sup>14</sup> In particular, acute kidney injury, which is one of the most common comorbidities, has been shown to be associated with higher mortality in ICU patients.<sup>15</sup> In our intensive care unit, acute kidney injury was encountered quite frequently due to the fact that the majority of patients were admitted to the ICCU with the diagnosis of ACS, and CAG was performed in the majority of these patients, and iodinated contrast media was used during the CAG procedure. A significant number of patients required CRRT, and most patients who developed contrast nephropathy were men. The fact that males required more CRRT can be explained by the higher number of males who underwent CAG and subsequent stent implantation. We should also add that patients who are intubated and develop MOF also require CRRT. Consistent with reports from other centers, in our ICCU, CRRT was mainly applied in cases of metabolic acidosis, which may be signs and symptoms of fluid overload resistant to diuretic therapy, hyperkalemia, and contrast nephropathy, HF, and end-stage renal disease.<sup>15,16</sup>

Infection is one of the most important acquired complications that can be encountered from the beginning of the patient's hospitalization throughout the hospitalization period, leading to a prolonged hospital stay and increased costs.<sup>17</sup> One of the most important issues is that the infection itself can lead to a longer hospital stay, and the probability of the occurrence of nosocomial infections increases in patients with a longer hospitalization period. If we look at the infection rates in our ICCU, it is seen that the rate of infection in females is higher than in men. Factors that may cause this result may be those females are older and have a longer hospital stay. In addition, the high rate of infection in female patients compared to males may be one of the main explanatory reasons for the higher mortality in females.

Because compliance with hygiene guidelines, especially hand hygiene, is critically important, and improved compliance reduces the incidence of in-hospital infections, hygiene training is provided to all healthcare personnel in our hospital at regular intervals to prevent nosocomial infections.<sup>18</sup>

A considerable proportion of arrhythmia patients have been admitted to the ICCU. Cardiac ablation therapy is a field that is

developing more and more with the technology advancing every day. Patients were followed in the ICCU before and after ablation therapy. Consistent with the current evidence suggesting that supraventricular arrhythmias are more common in women, whereas atrial fibrillation and ventricular tachycardia are more common in men, the majority of patients who underwent SVT ablation were women, while the majority of patients who underwent ablation for VT or AF appeared to be men.<sup>19,20</sup> Also, ICD implantation has predominantly been performed in males. In addition, while the number of men and women admitted to the hospital due to AV block was similar, only half of these patients required a permanent pacemaker at the end of the follow-up in the ICU.<sup>21,22</sup> The mortality rate among arrhythmia patients was very low, as expected.

This was a single-center, retrospective study, and detailed information on demographics was lacking. Our hospital has a specific emphasis on cardiology and cardiovascular surgery.

Except for high-risk ACS patients, patients with coronary artery disease can be followed up in service beds. Compared to other published ICU data, the number of stent implantations in our ICCU was relatively low, since most of the patients were actually subjects who underwent CAG or stent implantation during follow-up in the cardiology service and required observation after the procedure against the possibility of complications due to the complexity. In addition, the number of patients presenting with acute cardiogenic shock was significantly low. The reason for this result might have been the ability of patients to access healthcare services more easily or the administration of priority medication by ambulance technicians contacted from home via the emergency number.

Additionally, patients presenting with palliative and end-of-life issues were transferred to relevant care centers. A larger collection of data from other hospitals is required to assess the outcomes of patients in advanced ICCUs in Turkey.

## Conclusion

The number of females hospitalized in the ICCU is lower than that of males, but their average age and death rate were higher. Although the highest number of deaths in our intensive care unit was in males admitted with ACS, it was determined that the highest death rate was encountered in patients presenting with advanced heart failure. In addition, the development of MOF in the ICCU seems to be one of the most important causes of death due to the elderly population and the increase in the number of patients requiring multidisciplinary treatment. These results might suggest that cardiac diseases are less frequent but more severe in females, appear at later ages, and have a higher mortality rate.

**Ethics Committee Approval:** The study was approved by the medical ethics committee of Kartal Koşuyolu Education and Research Hospital (no: 2021/13/515).

**Informed Consent:** Written informed consent was obtained from all of the patients included in the study.

**Peer-review:** Externally peer-reviewed.

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