Evaluation of Geriatric Falls in Emergency Department During the Early Coronavirus-2019 Pandemic and Pre-Pandemic Periods

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Research Article

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Abstract

Purpose

This study aimed to investigate the clinical characteristics, presentations, outcomes, and healthcare costs of older patients who presented at the emergency department (ED) with falls in the periods before and during the Coronavirus disease-2019 (COVID-19) pandemic.

Methods

Hospital records one year before and after the onset of the COVID-19 pandemic were retrospectively analyzed through “International Statistical Classification of Diseases-10th Revision” codes. Age, gender, falls, triage classification, length of stay (LOS) in the hospital and ED, COVID-19 status, Glasgow coma scale (GCS), consultations-comorbidities, injury status, outcomes in the ED, and costs were recorded.

Results

The study comprised of 3,187 patients aged ≥ 65 years admitted to the ED of a university hospital between March 2019 and 2021. In terms of pre-pandemic and pandemic periods; older patients presenting with falls to the ED, consultations, Charlson Comorbidity Index (CCI), and LOS in ED were lower in the pandemic period, but costs were higher (p = 0.03, p = 0.01, p = 0.01, p = 0.01 and p = 0.02, respectively). Hospitalization/mortality rates were higher in COVID-19-positive patients (77.2%) than in COVID-19-negative patients (4.6%) within the pandemic period and the patients in the pre-pandemic period (22.8%), likewise for the costs (both p = 0.01).

Conclusion

Though the number of geriatric fall presentations to ED, comorbidity burden, consultations, and LOS in the ED was lower, direct costs were higher during the pandemic period, particularly for COVID-19 positive older patients admitted to ED with falls than the pre-pandemic period, and those patients were with poorer outcomes.

KEY SUMMARY POINTS

Aim: This study aimed to investigate the clinical status, outcomes, and healthcare costs of older patients who presented at the emergency department (ED) with falls in the periods before and during the Coronavirus disease-2019 (COVID-19) pandemic.

Findings: Though the number of geriatric fall presentations to ED, comorbidity burden, consultations, and LOS in the ED was lower, direct costs were higher during the pandemic period, particularly for COVID-19 positive older patients admitted to ED with falls than the pre-pandemic period, and those patients were with poorer outcomes.
Message: As older patients might achieve less care than they need which has been delayed or not reached, all nations need to plan for services given to older patients in extraordinary conditions.

INTRODUCTION

Falls are frequently seen geriatric syndromes in the older population, and deaths associated with the trauma of falls are also common [1]. Falls are not limited to older persons, but, many problems can emerge ranging from simple injuries to disability and even mortality in older adults who have fallen. Falls in older adults constitute a significant public health problem that also affects caregivers and healthcare workers [2]. Moreover, geriatric falls have a tendency of recurrence. So, detailed evaluation of falls in older adults, determination of risk factors, and development of strategies to prevent falls are critical [3]. The causes of falls are classified as intrinsic and extrinsic factors. Intrinsic factors include personal characteristics such as muscle strength and balance, and extrinsic factors are environmental causes such as slippery floors. Approximately 50% of falls occur outside the home [4]. However, falls outside the home are generally outdoor incidents that occur in active older individuals in good health and relatively at earlier ages, whereas falls within the home are caused by intrinsic factors such as loss of balance and strength [5].

Coronavirus disease-2019 (COVID-19) started to spread in Turkey on 11th March 2020. Just as in other countries throughout the world, restrictions were implemented in Turkey for people to stay at home and they were allowed only to go out at certain periods, especially the older population. Although these precautions were important in reducing the spread of the infection, they led to substantial negative outcomes such as social isolation, physical inactivity, and sarcopenia, particularly among older individuals [6, 7]. Compared to the period before the pandemic, an increase was determined in terms of social isolation [8], and physical inactivity [9] in older population in the pandemic. Besides, negative mental, physical, and emotional effects have been shown on older people staying at home because of COVID-19 [10, 11]. Results of studies on presentations with falls to the emergency department (ED) are diverse reporting higher [12] or lower rates during the pandemic period [13–16]. However, to the best of our knowledge, no research has been found to examine fall related injury types and regions, triage classification, consciousness levels, comorbidities-consultations as well as length of stay (LOS) in hospital/ ED, outcomes, and costs for older individuals during the pandemic, and compare to the prior pre-pandemic status.

So, the aim of this study is to investigate older patients aged ≥ 65 years presenting at ED of a university hospital because of falls, clinical and injury status related to falls, prognoses, outcomes and direct treatment costs in the first year of the COVID-19 pandemic and in the pre-pandemic period of one year before the pandemic by the use of International Statistical Classification of Diseases-10th Revision (ICD-10) codes.

MATERIAL AND METHODS
Study Universe and the Sample

This cross-sectional, descriptive study was conducted retrospectively by analyzing the data of patients who presented at the ED of Ege University Medical Faculty Hospital.

The study universe consisted of older patients who presented at the ED of Ege University Medical Faculty Hospital between 11 March 2019 and 10 March 2021. Two groups were formed. Patients who presented between 11th March 2019 and 10th March 2020 were defined as the pre-pandemic group and those who presented between 11th March 2020 and 10th March 2021 as the pandemic group. Ege University Medical Faculty Hospital is located in the center of Izmir, with a bed capacity of 1809 beds. The ED has a ground area of 1600m$^2$ and is a tertiary-level ED, providing service to an average of 400 patients per day. The inclusion criteria of the study were defined as; patients $\geq 65$ years, and a diagnosis of “Fall” coded as W00-19 in the Turkish version of the ICD-10. The patients with missing data were planned to be excluded.

Measures

In addition to age and gender; triage classification and distribution, LOS in ED (the time from presentation to leaving the ED-recorded as hours), LOS in the hospital (the time from the first presentation at ED to the time of leaving the hospital-recorded as hours), COVID-19 status as well as the Glasgow Coma Scale (GCS) [17,18], injury region and type, consultations counts, the Charlson Comorbidity Index (CCI) [19], outcomes and direct treatment costs were noted. The W00-19 diagnostic codes in the ICD-10 diagnosis coding system were used to determine presentations because of a fall. Data of those patients were examined from the hospital’s electronic records system.

COVID-19 status

COVID-19 status was determined by U07.3 diagnosis code which defines “real-time reverse transcriptase–polymerase chain reaction” (RT–PCR) positive COVID-19 patients.

Triage classification and distribution

Triage is a classification system used to determine the severity of diseases or injuries and those at the most life-threatening risk of patients presenting at the ED of a hospital. The triage is defined in the guidelines of the “Republic of Turkey Ministry of Health In-Patient Healthcare Facilities” about the systems and fundamentals of ED services application as follows; “The triage procedure is performed on presentation before registration of the patient. In the application of triage, red, yellow, and green colors are used according to the priority for examination, tests, treatment, and medical and surgical interventions.” Thus, classification according to the color codes is used in all emergency services in Turkey. There are four categories, with red as the top priority, followed by yellow, green, and black. Red represents a case that is very urgent, yellow that it is urgent but can wait, green that it can be delayed, and black that the case is exitus.
**Glasgow Coma Scale**

This is a test used to measure the state of consciousness of the patient. There are three sections of opening the eyes, motor response, and verbal response. The maximum points of 15 that can be obtained represent a normal state of consciousness. Lower points indicate different levels of consciousness as a worsening state. A decrease in the state of consciousness is a significant clinical finding affecting the prognosis of the case [17,18].

**Comorbid conditions**

The CCI was used to determine comorbidities. This index consists of items corresponding to different medical comorbid conditions and predicts ten-year mortality for a patient. Diagnoses of the diseases were classified by ICD codes. In this index, the higher the score, the higher the mortality risk [19].

**Injury type and region**

The injury region was classified anatomically as head, trunk, spine, upper extremity, and lower extremity. The injury type was classified as soft tissue, bone tissue, organ, and more than one type by examining all the other ICD-10 codes assigned to the patient. All the diagnosis codes referring to bone tissue injuries were examined and recorded according to the body area (S02.0-S02.9, S12.1-S12.9, S22.0-S22.9, S32.0-S32.9, S42.0-S42.9, S52.0- S52.9, S62.1-S62.0-S62.9, S72.0-S72.9, S82.0-S82.9, S92.0-S92.9).

**Patient outcomes and consultations**

Patient outcomes were classified as “discharge from ED”, “transfer to ward / Intensive Care Unit (ICU)”, “exitus in ED”, or “refused treatment. Consultation rates were obtained by examining the patient records with respect to the units consulted.

**Direct treatment costs**

Direct treatment costs were calculated as the total of all the invoices for all the procedures applied from the first presentation at the ED to hospital discharge, by examining the Social Security invoices of the patient prepared by the hospital administration. The direct hospital costs included doctor consultations, nursing care, medications, materials used, operations, laboratory tests, and imaging. As the healthcare services provided were under emergency conditions in the ED in Turkey, no additional payments were made by the patients, and the totals of the invoices were recorded as direct costs.

**Statistical Analysis**

The dataset was examined in two groups; pre-pandemic and pandemic. Costs, LOS, and outcomes were also analyzed in subgroups classified as pre-pandemic, pandemic COVID-19 positive, and pandemic COVID-19 negative older patients. Categorical data were analyzed with the Chi-square test. Numerical data with were compared using the Student’s *t*-test or One-way Anova and Tamhane corrections for three groups, and for ordinal data the Mann-Whitney U test was applied. The distribution of patients before and
during the pandemic according to the month of presentation was examined with Poisson regression analysis. A value of p<0.05 was accepted as statistically significant. Data were analyzed using IBM SPSS Statistics 21 program.

**Ethical Approval**

Approval of the study was obtained from the Turkish Ministry of Health, Healthcare Services General Directorate on the online Scientific Research Platform (2021-04-27T12_25_54). Approval for the study was then granted by the Medical Research Ethics Committee of Ege University (decision no:21-5.1T/9, dated 27.05.2021).

**RESULTS**

All adult patients presenting at ED from 2019 March to 2021 March (n=310,848) were examined [adult patients in the pre-pandemic period (March 2019-2020; n=190,540) and during the pandemic period (March 2020-2021; n=120,308)]. The flow-chart of patient inclusion is shown in Fig. 1. Finally, the study universe comprised of 3,187 patients aged ≥65 years (1,894 older people from the pre-pandemic period and 1,293 older patients from the pandemic period) with no missing data. The number of adults in all age groups, and older adults presenting with a fall (3,187) to the ED decreased during the first year of the COVID-19 pandemic (5.6% fallers vs. non-fallers 94.4%) compared to the pre-pandemic period (6.1% fallers vs. non-fallers 93.9%) (p=0.03). Poisson regression analysis was performed to determine differences in terms of distribution of frequency of falls according to months before and during the COVID-19 pandemic. There were differences related to months other than August, September, November, and December in the two periods. The number of older adults presented at ED because of a fall in March, April, May, June, October, January, and February significantly decreased during the pandemic compared to the pre-pandemic period (all p=0.01) (Table 1). As seen in Figure 2, except for July, the numbers of older adults who fell during the pandemic were lower than in the previous year before the pandemic. Regarding the distribution of the falls according to months, a greater number of cases occurred in the summer period during the pandemic with a peak in October (Figure 2). No statistically significant difference was determined with respect to age (p=0.32) and gender (p=0.34) between the pre-pandemic and pandemic periods for older patients admitted to ED with a fall (Table 2). Likewise, the distribution of age groups (65-74, 75-84, over 85 years of age) in the pandemic period and pre-pandemic period were similar (p=0.35). The majority of the cases with falls in both periods were females.

The characteristics of older patients admitted to ED with falls in both periods are shown in Table 2. Consultations requested from other clinics were higher before the pandemic. The departments from which consultations were mostly requested were Orthopaedics and Traumatology, Brain Surgery, and Thoracic Surgery Departments. The consultation rate for the Thoracic Diseases Department was 0.6% before the pandemic and 0.7% during the pandemic, with no statistically significant difference (p=0.74). Regarding outcomes; mortality was reported for four cases in the pre-pandemic period and two cases within the pandemic period in the ED. So those cases were evaluated within the hospitalization group as
“admitted to the ward/ICU or exitus”. Besides one patient per each period refused treatment, and those were evaluated in the “discharged from ED” group. The triage classifications, GCS of those patients at admission, the injury region and types as well as LOS in the hospital, and patient outcomes in the ED were similar in the pandemic and pre-pandemic periods (all p≥0.05) (Table 2). In the pre-pandemic period, four surgical operations were detected from the records, three orthopedic surgeries because of fragmented extremity fracture, and cardiovascular surgery (temporary transvenous pacemaker implantation). Patients were also grouped in terms of fracture types; skull and facial bone fractures, neck fractures, and forearm fractures decreased during the pandemic compared to the pandemic period (p=0.02, p=0.03, and p=0.03, respectively, data not shown). Similar rates were seen in both periods for fractures of the ribs, sternum or thoracic spine, lumbar spine and pelvis, shoulder and upper arm, wrist and hand, femur, tibia/fibula, and toes (all p≥0.05, data not shown). The length of stay in ED, and CCI score significantly decreased and direct costs in local currency (Turkish Lira-TRY) increased during the pandemic compared to the pre-pandemic period (p=0.01, p=0.01, and p=0.02, respectively).

Older patients admitted with falls to the ED were also analyzed in three subgroups, according to COVID-19 RT–PCR results for the pandemic group. COVID-19 positive patients (n=378) were 29.2% of older adults who presented at the ED because of a fall during the pandemic (n=1,293). Hospitalization rates-
mortality and costs were higher in COVID-19 positive patients (n=378) than COVID-19 negative patients within the pandemic period (n=915) and the patients in the pre-pandemic period (n=1,894), all admitted to ED with falls (77.2% vs. 4.6%, and 22.8%, p=0.01 and 6555.5±8444.3 TRY vs. 573.9±1311.3 TRY, and 1795.6±7355.2 TRY, p=0.01, respectively) (Table 2).

DISCUSSION

The COVID-19 pandemic has been studied to show negative effects on older adults in particular conditions such as nutrition, physical activity-fitness, mobility, sleep, mood, and quality of life [9, 20-23]. Results of presentations with falls to the ED are diverse reporting higher [12] or lower numbers during the pandemic period [13-16]. In our study, we showed that the number of geriatric fall presentations to ED, comorbidity burden, consultations, and LOS at the ED in those patients was lower, but direct costs were higher in the pandemic period than pre-pandemic period. Additionally, hospitalizations plus mortality in ED, and costs were higher, particularly for COVID-19 positive older patients admitted to ED with falls than in COVID-19 negative older patients during the pandemic period, and the pre-pandemic period.

The risk of falls was predicted to increase in older individuals because of the negative effects of the COVID-19 pandemic [7,10,24,25]. However, presentations with falls have decreased during the pandemic period in the studies carried out in EDs and other settings [13-16, 27-29]. It is considered that approximately half of all falls occur outside the home [30], and in Turkey, there were strict stay-at-home restrictions for older adults at the beginning of the pandemic. So, it could be expected that there would be a decrease in the number of falls for older adults. Accordingly, in the present study covering older adults admitted to the ED because of a fall two years before and during the first year of the COVID-19 pandemic, our results showed that the total number of patients presenting at ED, the number of patients aged ≥65
years, and the number of older adults presenting because of a fall decreased during the pandemic. During the pandemic, presentations to hospitals and healthcare facilities were significantly less for all adults, particularly older people because of all kinds of restrictions (lock-downs, continuing to stay at home with own preference and encouragement by policies, unavailability of hospitals, ED, inadequate services) and COVID-19 anxiety, also individuals postponed all kinds of health needs. Besides, lower application to EDs has been reported to be due to a decreased need for emergency healthcare services by society during the COVID-19 pandemic as there were fewer serious trauma cases [27-28,31].

Examining according to months, after the start of the pandemic except for July, the number of older adults who fell was lower than in the previous pre-pandemic year in our study whereas a greater number of fall cases occurred in the summer period during the pandemic as it would be expected because of increased outdoor activities, with a peak in October. In accordance with those findings in a study on older adults participating in the Ambulatory Blood Pressure in Older Adults cohort; fall rates in August, September, and October 2020 (reopening) were higher during the pandemic than the pre-pandemic previous year, and fall rates during the shelter-in-place policy period were lower than the pre-pandemic year expressing the importance of changes in community mobility [32]. Falls outside the home are generally shown in active, younger older adults, and falls at home in the frail older age group [33]. In a study investigating ED presentations among older adults during the COVID-19 pandemic, the older (75–84) and oldest old (>85 years) had the greatest decline in visit counts initially [13]. However, we could not show such significant differences between the pre-pandemic and pandemic periods in terms of the mean age of older patients admitted to ED with falls. Additionally, the distribution of age groups in both periods was similar.

The rate of requested consultations decreased during the pandemic compared to the pre-pandemic period whereas GCS, triage classifications, and injury region and types which indicate the need for emergency interventions as well as LOS in the hospital, and patient outcomes in the ED were similar in the pandemic and pre-pandemic periods. This can be explained by the increased workload because of COVID-19, and probable decision differences. As far as we could determine in the literature search, this data was not reported in previous studies. On the other hand, a decrease in the consultation rates was revealed in all age groups at the beginning of the pandemic, least with the oldest reaching to same rates after three months for older adults in primary healthcare centers [34]. Though the triage categories of the patients in both groups were similar in our study, in a recent study from Italy on all age group trauma cases before the pandemic and during a period of lockdown, there was a decrease in non-urgent and urgent but not critical cases, and an increase in life-threatening and extremely critical cases [35]. The difference in the results might be due to the inclusion of all trauma cases in all age groups. If it is assumed that falls during the pandemic would have occurred mostly at home because of the restrictions, it might be expected that there would be fewer injuries. However, in a study among all age groups from the Netherlands aiming to determine the impact of the first lockdown on the number and type of all trauma-related injuries presenting to ED, more frequent injuries due to a fall were reported [36]. In a study carried out on high-risk, community-dwelling older people, it was reported that injury status was similar in the pandemic and pre-pandemic periods among older adults who have fallen [15]. Likewise, injury type and
regions were similar in the present study at both periods. The rate of fractures to the head, neck, and forearm was lower during the pandemic compared to the pre-pandemic period in our study whereas the other fractures were similar. We could not find other studies investigating all fracture types related to falls among older patients regarding pre-pandemic and pandemic periods. In studies investigating all types of fractures in all age groups, and fall-related injuries during COVID-19; it was reported that the number of fractures decreased [37], and hip fractures did not change [38] or decreased [13]. No study could be found in the literature on the state of consciousness of older patients presenting with falls in comparison with pandemic and pre-pandemic periods which was found to be similar in the current study. In the study by Ilhan et al., in a tertiary-level trauma center, there was no change during the pandemic period regarding the need for surgery, ICU, or admission to wards, though there was a decrease in visit frequency of adult trauma patients during the pandemic period [39].

Length of hospital stay was reported to be similar during the pandemic period in a retrospective study on senior citizens for hip fractures due to a fall [40]. Likewise, the LOS in the hospital, and hospitalization/mortality rates in the ED were similar in the pandemic (25.8%) and pre-pandemic periods (22.8%) in the present study whereas mortality rates in ED at both periods were quite low. In a study from Ireland, there were reductions in admissions, and compliance with many of the Irish Hip Fracture Standards, LOS during the pandemic, but in-hospital mortality was similar in pre-pandemic and pandemic periods [41]. In contrary, in a meta-analysis, it was shown that COVID-19 increased the risk of mortality in patients with hip fractures [42]. On the other hand, the mean LOS in ED decreased in our study. The decrease in the LOS for older patients in the ED might have occurred due to lower number of patients admitted to the ED, and the COVID-19 infection risk in the ED. The lowest LOS in ED was among COVID-19 negative patients of the pandemic period than the pre-pandemic and COVID-19 positive patients. COVID-19 anxiety might have shortened the time spent for those patients. We could not find any research on how the LOS in the ED changed in older patients admitted with falls. However, it was reported that LOS in ED for the admitted and discharged patients were significantly higher in the COVID-19 period, though there was a decrease in the number of patients in a recent research among all age groups [43]. In another study by Guo et al., the length of resuscitation area stay was shown to be increased in the pandemic, variable for different departments [44]. The differences regarding the LOS in ED might be due to factors such as present resources (i.e. healthcare professionals), and the impact of the pandemic in that area or country. The direct costs increased for the older adults presenting at ED because of a fall during the pandemic period compared to the pre-pandemic period whereas the highest costs were for COVID-19 positive patients. No other study could be found in the literature that has investigated the costs for older adults presenting at the hospital because of a fall during the COVID-19 pandemic. In a study that examined the economic costs of hospital presentations due to COVID-19, the costs were much higher [45] than in our study as those costs were whole hospitalization costs. Application Notice of Public Healthcare Services Price Tariffs for Turkey was examined for 2019-2021, and no price increase was reported. So, the difference in costs between the two periods might be due to the costs associated with COVID-19. Hospitalization/mortality rates were the highest for COVID-19 positive patients (77.2%) in comparison with pre-pandemic (22.8%) and COVID-19 negative patients (4.6%) in the present study,
though the pandemic period in total and the pre-pandemic period's rates were similar with decreased number of patients admitted in the pandemic. Herein, median CCI for older patients admitted to the ED with falls was lower in the pandemic period in our study. This might reflect that older patients with multiple morbidity and falls did not apply to the ED of the hospital despite a higher risk of mortality. Non-COVID patients were unlikely to be hospitalized during the pandemic. Hospitalizations were reported to be lower during the COVID-19 pandemic period from the ED in a study from Italy in older patients with chronic conditions [46]. On the other hand, in another study on trauma cases over the age of 15, it was shown that the rate of hospitalizations increased [31]. Determinants such as demand for ED, supply for care need further investigation on those subjects [46]. It has also been reported that a fall is an atypical COVID-19 finding [47]. However, from the present data of our study, it was not possible to comment on.

One of the limitations of this study is that this is a single-center study. Some data were not reached because of the retrospective design of the study for the ED such as the location of the fall (i.e. at home), and mortality in the hospital, and in long-term. Besides, a cost analysis was not performed, only a comparison of direct treatment costs was performed in TRY. The strength of this study is that it is designed for a specific patient, and age group presented at ED at a tertiary level hospital in the third largest city in Turkey over a two-years period before the pandemic and during the pandemic.

CONCLUSIONS

In this study on the data of older adults admitted to ED because of a fall one year before the pandemic and in the first year of the pandemic; the number of all adult age groups, older adults, and also older adults presenting due to a fall at the ED during the COVID-19 pandemic decreased compared to the pre-pandemic period. Though comorbidity burden in the admitted patients, consultations requested, and LOS at the ED in those older patients who presented with a fall were lower, direct costs were higher in the pandemic period than pre-pandemic period whereas more hospitalizations from the ED, and higher costs were shown particularly for COVID-19 positive older patients than both COVID-19 negative older patients of the pandemic period and the pre-pandemic period.

As the results of this study show only the cross-sectional data at the beginning of the pandemic, it might be hypothesized that the negative effects of the pandemic on all aspects of health will be more apparent for all age groups in the later post-COVID-19 era. Longitudinal follow-up studies need to be conducted to show long-term outcomes for older persons in the post-pandemic period. Besides, considering the higher mortality of older adults in the pandemic, it might be assumed that older persons might have achieved less care than they needed which has been delayed or not reached. So, all nations need to plan for extraordinary conditions and older persons regarding services given in all settings.

Declarations

STATEMENTS AND DECLARATIONS
Funding
There is no funding provided for this study.

Ethical approval
The research was carried out according to the guidelines of the Declaration of Helsinki, and approved by Medical Research Ethics Committee of Ege University (No: 21-5.1T/9 and approval date: 27.05.2021), and from the Turkish Ministry of Health, Healthcare Services General Directorate on the online Scientific Research Platform (2021-04-27T12_25_54).

Informed consent
Informed consent was not obtained from the participants because of the retrospective design of the study and the anonymous analysis of the data.

Conflict of interest
The authors declare that they have no conflicts of interest.

Acknowledgements
None.

References


Tables

Table 1 Regression analysis of older patients presenting at emergency department because of a fall according to months

<table>
<thead>
<tr>
<th>Months</th>
<th>Pre-pandemic falls (n)</th>
<th>Falls during pandemic (n)</th>
<th>Standard Error</th>
<th>Z</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>March</td>
<td>175</td>
<td>95</td>
<td>0.128</td>
<td>-3.860</td>
<td>0.01</td>
</tr>
<tr>
<td>April</td>
<td>181</td>
<td>78</td>
<td>0.122</td>
<td>-3.100</td>
<td>0.01</td>
</tr>
<tr>
<td>May</td>
<td>143</td>
<td>104</td>
<td>0.128</td>
<td>-4.860</td>
<td>0.01</td>
</tr>
<tr>
<td>June</td>
<td>172</td>
<td>146</td>
<td>0.135</td>
<td>-6.215</td>
<td>0.01</td>
</tr>
<tr>
<td>July</td>
<td>125</td>
<td>143</td>
<td>0.129</td>
<td>-2.471</td>
<td>0.01</td>
</tr>
<tr>
<td>August</td>
<td>154</td>
<td>108</td>
<td>0.113</td>
<td>-1.456</td>
<td>0.15</td>
</tr>
<tr>
<td>September</td>
<td>122</td>
<td>97</td>
<td>0.122</td>
<td>1.099</td>
<td>0.27</td>
</tr>
<tr>
<td>October</td>
<td>157</td>
<td>134</td>
<td>0.126</td>
<td>-2.827</td>
<td>0.01</td>
</tr>
<tr>
<td>November</td>
<td>172</td>
<td>99</td>
<td>0.136</td>
<td>-1.686</td>
<td>0.09</td>
</tr>
<tr>
<td>December</td>
<td>166</td>
<td>78</td>
<td>0.118</td>
<td>-1.347</td>
<td>0.18</td>
</tr>
<tr>
<td>January</td>
<td>162</td>
<td>99</td>
<td>0.126</td>
<td>-4.379</td>
<td>0.01</td>
</tr>
<tr>
<td>February</td>
<td>165</td>
<td>112</td>
<td>0.137</td>
<td>-5.502</td>
<td>0.01</td>
</tr>
</tbody>
</table>

* Poisson Regression analysis

Table 2 Characteristics of older patients admitted to the emergency department with a fall in the pre-pandemic period and during the first year of the COVID-19 pandemic
<table>
<thead>
<tr>
<th></th>
<th>Pre-pandemic period (n=1894)</th>
<th>Pandemic period (n=1293)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>77.9±8.5</td>
<td>77.6±8.1</td>
<td>0.32*</td>
</tr>
<tr>
<td>Gender, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>1155 (61.0)</td>
<td>810 (62.6)</td>
<td>0.34**</td>
</tr>
<tr>
<td>Males</td>
<td>739 (39.0)</td>
<td>483 (37.4)</td>
<td></td>
</tr>
<tr>
<td>Triage classification(^a), n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yellow</td>
<td>1768 (93.3)</td>
<td>1221 (94.4)</td>
<td>0.46**</td>
</tr>
<tr>
<td>Green</td>
<td>54 (2.9)</td>
<td>26 (2.0)</td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td>31 (1.6)</td>
<td>18 (1.4)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>41 (2.2)</td>
<td>28 (2.2)</td>
<td></td>
</tr>
<tr>
<td>Consultations, n (%)</td>
<td></td>
<td></td>
<td>0.01**</td>
</tr>
<tr>
<td>Yes</td>
<td>1074 (66.7)</td>
<td>814 (63.0)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>820 (33.3)</td>
<td>479 (37.0)</td>
<td></td>
</tr>
<tr>
<td>GCS score</td>
<td>15 (10-15)</td>
<td>15 (11-15)</td>
<td>0.47***</td>
</tr>
<tr>
<td>CCI score</td>
<td>4 (2-11)</td>
<td>3 (2-9)</td>
<td>0.01***</td>
</tr>
<tr>
<td>Injury, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>523 (27.6)</td>
<td>323 (25.0)</td>
<td>0.09**</td>
</tr>
<tr>
<td>Injury region, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>83 (15.9)</td>
<td>33 (10.2)</td>
<td>0.05**</td>
</tr>
<tr>
<td>Thorax/Abdomen</td>
<td>50 (9.6)</td>
<td>37 (11.5)</td>
<td></td>
</tr>
<tr>
<td>Upper extremity</td>
<td>71 (13.6)</td>
<td>45 (13.9)</td>
<td></td>
</tr>
<tr>
<td>Lower extremity</td>
<td>263 (50.3)</td>
<td>184 (57.0)</td>
<td></td>
</tr>
<tr>
<td>Spine</td>
<td>21 (4.0)</td>
<td>13 (4.0)</td>
<td></td>
</tr>
<tr>
<td>More than one region</td>
<td>35 (6.7)</td>
<td>11 (3.4)</td>
<td></td>
</tr>
<tr>
<td>Injury type, n (%)</td>
<td></td>
<td></td>
<td>0.20**</td>
</tr>
<tr>
<td>More than one type</td>
<td>33 (6.3)</td>
<td>11 (3.4)</td>
<td></td>
</tr>
<tr>
<td>Organ</td>
<td>36 (6.9)</td>
<td>19 (5.9)</td>
<td></td>
</tr>
<tr>
<td>Soft tissue</td>
<td>79 (15.1)</td>
<td>58 (18.0)</td>
<td></td>
</tr>
<tr>
<td>Bone tissue</td>
<td>375 (71.7)</td>
<td>235 (72.8)</td>
<td></td>
</tr>
<tr>
<td>Patient outcomes at ED, n (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharged from ED</td>
<td>1463 (77.2)</td>
<td>959 (74.2)</td>
<td>0.05**</td>
</tr>
<tr>
<td>Admitted to ward or ICU or Exitus</td>
<td>431 (22.8)</td>
<td>334 (25.8)</td>
<td></td>
</tr>
<tr>
<td>Discharged from ED(^b)</td>
<td>1463 (77.2)</td>
<td>86 (22.8) / 873 (95.4)</td>
<td>0.01**§</td>
</tr>
<tr>
<td>Admitted to ward or</td>
<td>431 (22.8)</td>
<td>292 (77.2) / 42 (4.6)</td>
<td></td>
</tr>
<tr>
<td>ICU or Exitus&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>------</td>
</tr>
<tr>
<td>Length of stay in ED (hours)</td>
<td>8.6±18.6</td>
<td>7.3±9.9</td>
<td>0.01&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
<tr>
<td>Length of stay in ED&lt;sup&gt;b&lt;/sup&gt;, (hours)</td>
<td>8.6±18.6</td>
<td>7.3±9.3 / 7.2±9.6</td>
<td>0.05****</td>
</tr>
<tr>
<td>Length of hospital stay (hours)</td>
<td>47.5±150.2</td>
<td>49.8±142.5</td>
<td>0.79&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
<tr>
<td>Length of hospital stay&lt;sup&gt;b&lt;/sup&gt;, (hours)</td>
<td>47.5±150.2</td>
<td>59.5±179.7 / 44.7±124.3</td>
<td>0.26****</td>
</tr>
<tr>
<td>Direct costs (TRY)</td>
<td>1795.6±7355.2</td>
<td>2322.6±5425.0</td>
<td>0.02&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
<tr>
<td>Direct costs&lt;sup&gt;b&lt;/sup&gt; (TRY)</td>
<td>1795.6±7355.2</td>
<td>6555.5±8444.3 / 573.9±1311.3</td>
<td>0.01****&lt;sup&gt;‡&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Numerical variables are expressed as mean (SD) unless otherwise stated.

CCI Charlson Comorbidity Index, ED Emergency Department, GCS Glasgow Coma Score, ICU intensive care unit, TRY Turkish Lira, COVID-19 Coronavirus disease-2019

<sup>a</sup>Red: very urgent, yellow: urgent but can wait, green: can be delayed

<sup>b</sup>Data of pre-pandemic period, pandemic COVID-19 positive and COVID-19 negative patients

*Independent samples t-test,**Pearson χ² test, ***Mann-Whitney U test, ****One way Anova

†Values given as median (minimum-maximum)

‡ Post Hoc Tamhane corrections, all groups are different at p<0.05 level

§Post Hoc z-test and Bonferroni corrections were applied, all groups are different at p<0.01 level

**Figures**
Figure 1

Flow-chart of patient inclusion
Figure 2

Distribution of older adults presenting at emergency department after a fall according to months.

During the pre-pandemic period (March 2019-2020)

During the pandemic period (March 2020-2021)