Kalça Kırığı Nedeniyle Ameliyat Olan Yaşlı Hastalarda Bir Yıllık Ölüm Oranı: Sistematik Bir İnceleme ve Meta-Analiz

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Öz

Amaç: Bu çalışma, kalça kırığı nedeniyle ameliyat edilen hastaların bir yıllık mortalite oranlarının belirlenmesi amacıyla yayınlanmış çalışmalardan elde edilen verilerin sistematik olarak incelenmesi amacıyla yapıldı.

Gereç ve Yöntem: Bu araştırma meta-analiz yöntemi ile gerçekleştirildi. Literatür taraması "Ortopedik cerrahi, geriatrik, mortalite, kalça kırıkları" anahtar kelimeleri ile yapıldı. Konuyla ilgili 2009-2019 yılları arasında Türkçe ve İngilizce olarak yayınlanmış, tam metin erişim hakkı ücretsiz olan araştırma makalelerine yer verildi.

Bulgular: Web of Science, Medline, PubMed, CINAHL, Ulakbim ve Google Akademik'te yapılan tarama sonucunda toplam 1761 çalışmaya ulaşıldı. Dahil edilme kriterlerini karşılayan beş çalışma meta-analize dahil edildi. Çalışmaya dahil edilen araştırmların ikisi tanımlayıcı, ikisi kohort araştırması ve biri retrospektif türde olup, yapılan sistematik inceleme sonucunda çalışmalardaki örneklem sayısının 46-948 arasında olduğu belirlendi. İncelenen çalışmalarda kalça kırığı ameliyatı geçiren yaşlı hastalarda mortalite oranları %10,3-22 olarak belirlendi.

Sonuç: Dünyada ve ülkemizde yaşlılarda sıklıkla karşılaştığımız kalça kırığı ve buna bağlı ölümlerin oluşmasında etkili risk faktörlerinin belirlenmesi ve bu süreçte eşlik eden komorbiditelerin kontrol altında tutulması bakım ve tedavi sürecine olumlu katkılar

sağlayacaktır.

Anahtar Kelimeler

Kalça Kırığı, Ortopedik Cerrahi, Yaşlı, Mortalite

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One-Year Mortality Rate in Elderly Patients Undergoing Surgery Because of Hip Fracture: A Systematic Review and Meta-Analysis

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Abstract

Aim: This study was conducted in order to systematically examine the data obtained from published studies to determine the one-year mortality rates of patients who underwent surgery for hip fracture. Materials And Methods: This research was carried out with the meta-analysis method. The literature search was made with the keywords “orthopedic surgery, geriatrics, mortality, hip fractures". Research papers which were published in Turkish and English languages between 2009 and 2019 on the subject with full text access right free of charge were included in the evaluation.

Results: As a result of the search conducted on Web of Science, Medline, Pubmed, CINAHL, Ulakbim, Google Scholar, a total of 1761 studies were reached. Five studies that met the inclusion criteria were included in the meta-analysis. Two of the studies included in the study were descriptive, two were cohort research and one was in retrospective type, and the number of samples in the studies as a result of the systematic examination was determined to be between 46-948. Mortality rates in elderly patients who underwent hip fracture surgery were determined as 10.3-22% in the studies examined.

Conclusion: Determining the effective risk factor in the occurrence of hip fracture and subsequent mortality, which we frequently encounter in the elderly in the world and in Turkey country, and keeping the accompanying comorbidities under control in this process

will provide positive contributions to the care and treatment process.

Keywords

Hip Fractures, Orthopedic Surgery, Elderly, Mortality

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Introduction

The elderly population is increasing in parallel with the developments in the field of health throughout the world. Elderly people are at risk of possible trauma due to increased age and decreased physical capacity, comorbid diseases, loss of vision and hearing and reduced reflexes and bone loss. These age-related physiological changes are among the important factors affecting mortality and morbidity in the elderly. These changes also have undesirable effects on the bones (Koç et al., 2012; Özmen and Aydınlı, 2017; Öztürk et al., 2008; Turhan and Arıcan, 2019). Hip fractures account for 84% of bone lesions in the elderly population (Özmen and Aydınlı, 2017; Turhan and Arıcan, 2019). On average, one out of three patients with hip fracture dies within the first year, and the majority of patients experience limitation of movement after the first year. When factors such as comorbidity, fragility, polypharmacy, nutrition, body mass index, risk of embolism and difficulty in patient compliance are added to this limitation, this renders the treatment quite complicated and increases the mortality rate. The mortality rate in the first year after hip fractures was reported to be 20% (Bakış et al., 2014; Edipoğlu et al., 2013; Folbert et al., 2017; Karaman et al., 2014; Özmen and Aydınlı, 2017; Turhan and Arıcan, 2019). In elderly patients with a similar history of hip fractures, delayed surgery was associated with mortality (Moloney et al., 2016). The difference of the surgical method to be applied can lead to lower mortality rate after surgery and different functional outcomes after operation (Ilgın et al., 2018). Whether the surgical treatment to be administered is elective or urgent, type of anesthesia and postoperative pain management are other important factors affecting mortality (Ersoy et al., 2013; Küçükosman et al., 2019). The presence of cardiac, pulmonary and endocrine diseases affecting surgical treatment evaluates patients more effectively in terms of mortality with the physical condition scale, which shows the comorbid disease state by American Society of Anesthesiologists (ASA) in order to determine the type of surgery (Özmen and Aydınlı, 2017; Turhan and Arıcan, 2019). This study presents the studies conducted in the last 10 years which investigate the mortality rate examined in elderly patients with hip fractures in the first year after surgery as a meta-analysis with a systematic and up-to-date perspective.

1. Methods

This research was carried out with the meta-analysis method, which is one of the quantitative research methods. The study was carried out between October 2019 and December 2019. Since the research is a meta-analysis study, the literature scanning model was used. Ethics committee approval was not obtained for the study since the literature review did not have an effect on animals or humans directly. A systematic compilation and meta-analysis of researches evaluating the one-year mortality rates of geriatric patients undergoing surgery due to hip fracture was planned. The literature search was made with

the keywords "Orthopedic surgery, geriatrics, mortality, hip fractures". Research papers which were published in Turkish and English languages between 2009 and 2019 on the subject with full text access right free of charge were included in the evaluation. As a result of the scanning, 40 studies were accessed in CINAHL, four studies in Web of Science, 175 studies in Google Scholar, six studies in Web of Science, 186 studies in PubMed, 200 studies in Medline and 580 studies in Ulakbim. Systematic compilation and meta-analyses were arranged according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Statement) and MOOSE (Meta-analysis of Observational Studies in Epidemiology) criteria. The research articles, which were independently reviewed by the researchers initially in the form of titles and abstracts and then in full text, were examined regarding appropriateness for analysis and 5 studies were selected. The article selection process is summarized in the PRISMA flow chart (Figure 1).

Criteria for Inclusion in the Study:

- The study must have been published in a national/international refereed journal,
- The study language must be written in English or Turkish,
- The study was conducted between 2009 and 2019,
- The study should include the one-year mortality rate of patients who underwent surgery for hip fracture,
- The study must have a quality assessment score.

For the remaining five publications at the end of the study, 12 criteria, which were proposed by Polit and Beck among the criteria for evaluating research quality, were used. These criteria allow for an overall assessment of the objectives, sample characteristics, findings and results of the studies. Each study was evaluated on all criteria and separately by the researchers, and if it meets each item, it is given a "0 point" value if it does not meet "1 point". The scores that the study can get according to the criteria range from 0 to 12 (Polit and Beck, 2009). In the study, the articles belonging to all subgroups were independently examined by two researchers and the articles with a score of seven and above were evaluated as high quality (Table 1).-to-date perspective.

1.1. Data Analysis

The data were processed on a standard data extraction form for collection and classification. The data extraction form included information about the authors, socio-demographic data, purpose, design, year of the study and scales used in the study. In the analysis of the data, among the methods of combining the research results, methods were chosen according to the data type. In the research, for the application of the meta-analysis technique, the licensed CMA 3 (CMA 3) version of the CMA statistical package program and for the compliance among the evaluators, Kappa statistics were used.

Table 1. Characteristics of Researches Evaluated in the Study

NO	Name of the research	Purpose of the research	Measurement tools used	Characteristics of the Sample	Results obtained	Quality assessment score
1	Predictors of non-institutionalized survival 1 year after hip fracture Buecking et al., 2017	The aim of this study is to develop a prognostic tool predicting survival within 1 year after hip fracture	HrQoL. (health-related quality of life) measuring survival Barthel Index affecting pre-fracture activity level (BI) Geriatric Depression Scale (GDS) Mini Mental State Examination (MMSE)	Geriatric patients n: 312 patients with cohort type	MaRTHi score is the first tool to predict survival. Age, comorbidities and cognitive ability affect health and quality of life prior to fracture	11
2	Mortality After Distal Femoral Fractures in Elderly Patients Streubel et al., 2010	The aim of this study was to evaluate the mortality of elderly patients after femur and hip fractures	Body Mass Index [BMI] Charlson Comorbidity Index (CCI) ICD-9 (International Classification of Diseases, Ninth Revision)	Geriatric patients n: 44 patients with cohort type	It causes periprosthetic fractures and reduced post-fracture survival in patients with dementia, heart failure, advanced kidney disease and metastasis. The age-adjusted Charlson Comorbidity Index can be a useful tool for predicting survival after fracture. Surgical delay greater than 4 days increases the risk of death in 6 months and 1 year	9

3	Assessment of Peroperative Parameters Affecting Mortality in Geriatric Hip Fractures. Çetinkaya et al., 2015	The aim of this study was to evaluate the potential risk factors affecting mortality in geriatric patients undergoing orthopedic surgery	ASA	Geriatric patients with n: 116 patients Descriptive type	Advanced age and high ASA scores increase the risk of mortality. The length of hospital stay and the pre- and post-operative time will reduce perioperative complications. In addition, early mobilization by selecting the type of fracture and the appropriate surgical method for the patient is an important factor in reducing mortality.	10
4	Retrospective Analysis of the Epidemiological Characteristics of Hip Fractures in the Elderly Okkaoglu et al., 2016	In this study, the aim was to investigate the epidemiology and mortality rates regarding elderly hip fractures, which are frequent due to increasing lifespans and osteoporosis	ASA	Geriatric patients n: 428 patients with Retrospective type	Hip fractures in elderly were shown to be associated with high mortality risk	10
5	The one- year mortality rates of patients over the age of 65, who were administered surgical treatment due to hip fracture Turhan and Arıcan, 2019	In this study, the aim was to investigate the mortality rates of patients administered surgical treatment due to hip fracture in the first year after surgery and the factors affecting this	-	Geriatric patients n: 164 patients with Descriptive type	It was found that the most important factors affecting mortality after surgery were the increased age and the period between hospitalization-surgery and surgery and discharge	9

1.2. Research Question

- What is the one-year mortality rate in elderly patients who underwent hip fracture surgery?

1.3. Effect Size

In this study, "Odds Ratio" was used to calculate the effect size. It is one of the most popular advanced statistical methods used to determine the factors (risk factors) that may be effective in the emergence of a disease or condition. When the odds ratio is equal to 1, it means that there is no relationship between variables. If this ratio is above 1, it shows the effectiveness of the risk ratio. The minus (-) sign before the effect values indicates that the mortality risk factor, the effect of which is measured in the studies, is negatively oriented/in favor of the control (non-mortality) group, and the positive (+) sign indicates that the effect is positive / in favor of the experimental group (with mortality). If the effect size is zero (0) or close to zero, it shows that there is no effective result for or against the mortality and non-mortality group (Dinçer, 2014).

1.4. Heterogeneity

In this study, Cochran's Q statistics was used to test heterogeneity among studies. This test tests the null hypothesis, where all studies evaluate the same effect. This analysis is used to determine whether there is a statistically significant variance (Higgins Green, 2011). In the calculation of the heterogeneity measurement except for Cochran's Q statistics, "p, T2, T, I2" coefficients are often used. All these coefficients are dependent on Q. Q statistics and p value are used for significance test. As for I2 , it is the heterogeneity ratio of the total change in the observed effect. Heterogeneity is related to the percentage of explanation of variance of current studies. Heterogeneity increases as percentage of explanation increases (Borenstein et al., 2013). In heterogeneity assessment, if the heterogeneity rate is (I2) below 25%, it is considered non-existent; if it is between 25-50%, it is considered low; if between 51-75%, it is considered moderate; and if above 75%, it is deemed high (Higgins et al., 2003). If the effect size is zero (0) or close to zero, it is concluded that there is no effective result for or against the non-mortality group (Dinçer, 2014). Due to the high heterogeneity I2 value in the research, in the meta-analysis, random effects model was used instead of fixed effects model. In this study, $p < 0.05$ was considered statistically significant, and the results of the study were interpreted according to these values. In the first step, the scatterings in the funnel graph were examined in order to determine whether there was publication bias or not in the studies the meta-analysis of which were performed. Then Egger's linear regression test and Begg and Mazumdar rank correlation statistics were conducted.

2. Results

2.1. Scan Results

As a result of the scan, five studies that met the inclusion criteria were included in the meta-analysis (Figure 1).

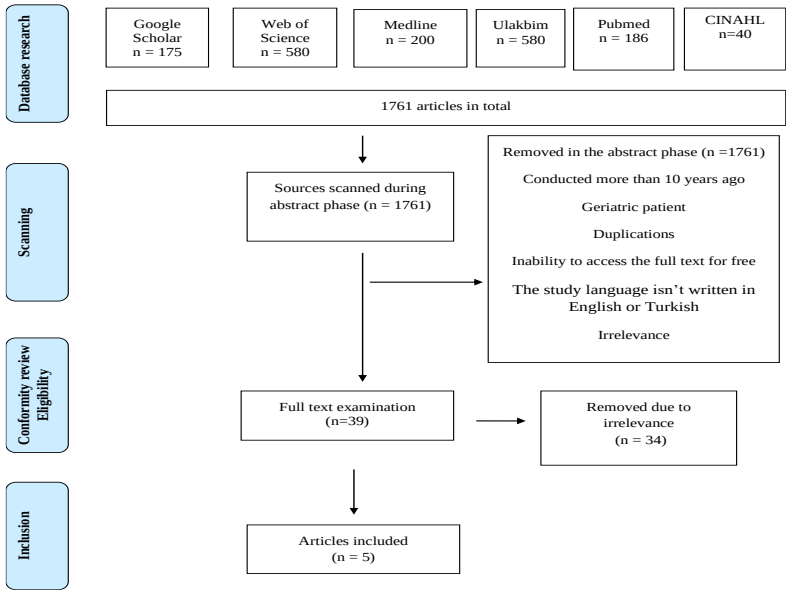


Figure 1. PRISMA Flow Chart

2.2. Assessment of Methodological Quality

Regarding the inter-evaluator accordance and inter-rater reliability accordance analysis, kappa values range from 0.768 to 0.891 on the basis of articles. The overall accordance ratio kappa value was found to be 0.829.

2.3. Characteristics of the Studies Evaluated

Among the studies included in the compilation, two were descriptive, two cohort and one retrospective type, and they were published between 2009 and 2019. The oldest dated publication belongs to 2010.

2.4. Characteristics of the Sample Group in the Studies Evaluated

The sample groups consisted of individuals over 50 years of age who underwent surgery due to hip fracture. In the study conducted by Buecking et al. (2017), the mean age is 81 ± 8 years. The age range of the group is 60-99. 29% of the patients are male and 71% are female. A total of 312 patients underwent hip fracture surgery with a 1-year mortality rate of 33.3%. In the study conducted by Streubel et al., (2011) the average age is 77.6 ± 9.8. The age range of the group is 60–96 years. 20% of the patients are male and 80% are female. A total of 44

patients underwent hip fracture surgery with a 1-year mortality rate of 22%. In the study conducted by Çetinkaya et al., (2016), the average age is 75.4 . The age range of the group is 65–99 years. 39.6% of the patients are male and 60.4% are female. A total of 104 patients underwent hip fracture surgery with a 1-year mortality rate of 10.3%. In the study conducted by Okkaoglu et al., (2016), the average age is 78.65 ± 8.58 . The age range of the group is 55-100. 35.51% of the patients are male, and 64.49% are female. A total of 428 patients underwent hip fracture surgery with a one-year mortality rate of 17.99%. In the study conducted by Turhan and Arıcan (2019), the mean age of the deceased group (85.97 ± 7.49) was statistically significantly higher than the group of survivors (79.02 ± 8.92). The sample consists of patients over the age of 65. 50% of the patients are male, and 88% are female. A total of 164 patients underwent hip fracture surgery and the 1-year mortality rate was calculated as 21.73%.

2.5. Questionnaire and Scales Used in the Studies Evaluated

In the studies we included in the meta-analysis, in order to assess mortality in patients, Buecking et al., (2017) tried to develop HrQoL (health related quality of life) which serves to predict survival. They used Barthel Index (BI), Charlsen Comorbidty Index (CCI), Geriatric Depression Scala (GDS) and Mini-Mental State Examination (MMSE) to determine the pre-fracture activity level. Streubel et al., (2011) – They used body mass index (BMI) and ICD-9 (International Classification of diseases ninth revision). Çetinkaya et al., (2016) and Okkaoğlu et al., (2016) on the other hand, used ASA classification.

2.6. Mortality Development Status in the Studies Evaluated

Mortality rates in elderly patients who underwent hip fracture surgery were determined as 10.3-22% in the studies examined.

2.7. Effect Sizes and Heterogeneity

According to the findings obtained from the research studies, the sample of the research consists of 1064 people. In the study, heterogeneity test was applied for variables while evaluating the presence of mortality. In the studies, as a result of heterogeneity test, p value was found to be less than 0.05 and Q (77.145) value to be higher than the value corresponding to df. As a result of the individual studies included in the analysis, the researches examined acTcording to the existence of mortality in the meta-analysis application were found to be heterogeneous. The statistical value of I2 was calculated as 94.815 (Table 2).

Table 2. Heterogeneity Test Results for Mortality

	Effect Size and 95% Internal			Test of null (2-Tail)		Heterogeneity			Tau-squared				
Model	Number of Studies	Point estimate	Lower limit	Upper limit	Z-value	P-value	Q-value	df (Q)	P-value	I-squared	Tau-Squared	Standard Error	Variance	Tau
Fixed	5	0.092	0.075	0.113	-22.835	0.000	77.145	4	0.000	94.815	1.125	0.995	0.990	1.061
Random	5	0.058	0.022	0.152	-5.774	0.000								

In Figure 2, the results of the meta-analysis regarding the five studies included in the study, which investigated the development of mortality in geriatric patients with hip fractures and who underwent surgical intervention, were shown by forest plot. With the analysis made according to the random effects model, the overall effect size on the development of mortality was found to be statistically effective with a value of 0.058 (GA; 0.022-0.152; p <0.05).

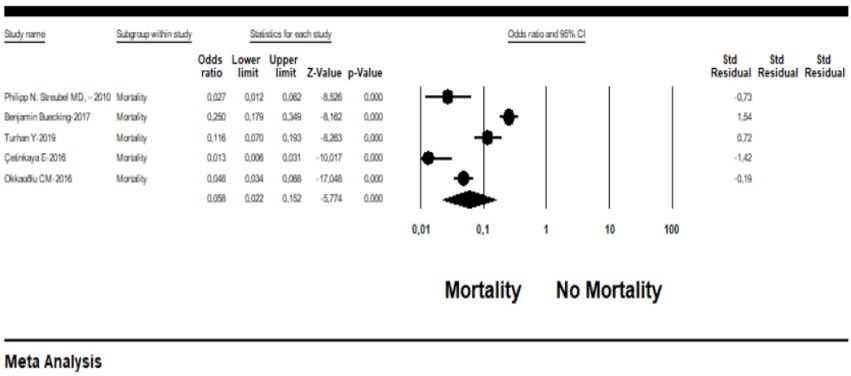
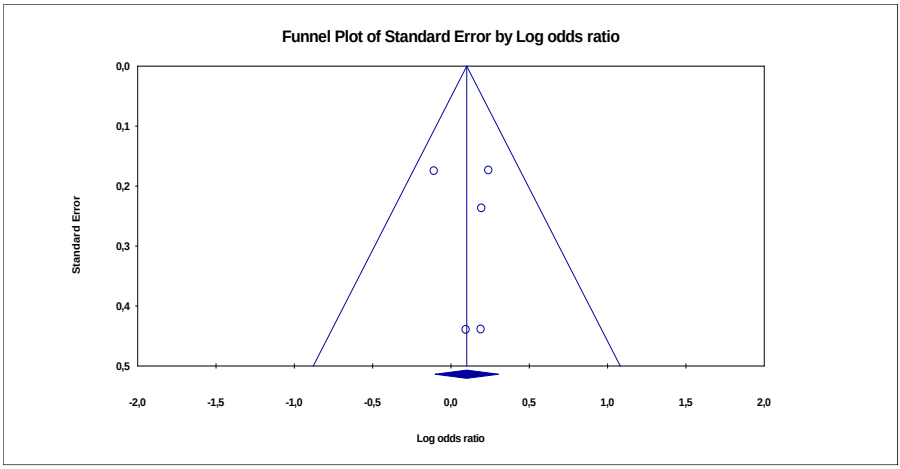


Figure 2. Meta-analysis Diagram Showing the İmpact Direction of the Research

2.8. Publication Bias

The results of the funnel scatter plot, which are also considered as a visual summary of the meta-analysis data set and which show the probability of publication bias, are shown in Figure 3. In the funnel scatter plot, the standard error value of the studies is shown on the y-axis and the effect size on the x-axis. Studies with a small standard error value concentrate towards the top of the funnel shape and close to the average effect size. As for studies with big error value, they are positioned towards the bottom of the figure. In the absence of publication bias, the studies are expected to spread symmetrically on both sides of the vertical line showing the combined effect size (Rothstein et al., 2005). Another way to determine publication bias in meta-analysis studies is to calculate Kendall's tau b coefficient. In the absence of publication bias, this coefficient is expected to be close to 1 and the two-tailed p value to make no significant difference, that is, the p value is expected to be greater than 0.05 (Dinçer, 2014). According to the values calculated in this statistics (Kendall's tau b = 0.300; p = 0.462), there was no publication bias in the studies included in the meta-analysis.



Orwin's Fail-Safe N calculates the number of studies that may be missing in a meta-analysis. The number of publications required for meta-analysis was calculated as 6.

Figure 3. Funnel Scatter Plot

3. Discussion

Hip fractures in the elderly can easily occur after a simple fall rather than high-energy traumas observed in young individuals. Although low bone quality due to osteoporosis with advanced age and the presence of additional diseases lead to this situation, this also increases the mortality rates after fracture (Brauer et al., 2009; Moran et al., 2005). In many studies in the literature, the one-year mortality rates are reported to range from 20% to 35% (Çetinkaya et al., 2016). In the studies examined within the scope of meta-analysis, the one-year mortality rate was observed to be within the range of 10.3-22% (n = 1064). In the studies conducted, the overall effect score was found to be p <0.05 and it was confirmed that the mortality risk was significant in geriatric patients who underwent hip fracture surgery. In this meta-analysis study, the presence of mortality was examined in general. Different findings may be observed in studies individually investigating specific effects such as different populations of the age group that may affect mortality, the presence, type and number of comorbid diseases. In the study conducted by Okkaoğlu et al., (2016), included within the scope of examination, the ratio of mortality over age groups was 15% in patients aged between 65-74, 16% in patients aged between 75-84, and 28% in patients aged 85 and above. Nowadays, there is an increasing number of studies reporting that mortality can be decreased and the expenses of the patient can be reduced with an effective preoperative evaluation of the patient and the convenience of the anesthesia method (Ersoy et al., 2016; Karaman et al., 2014). Two of the studies (3,4) which were examined within the scope of the meta-analysis evaluated the patients with ASA. In addition, there is one (2) study which evaluated patients with CCI in terms of comorbid diseases. The literature reports that the time between fracture and surgery is associated with mortality

rate in one year (Eren, Koyuncu and Gönen, 2019). In two of the studies (3,5) that we examined, it was stated that mortality risk increased within the period of hospital stay and in the period before and after surgery. Poor mental status in elderly patients with hip fractures was reported to increase mortality seven times (Sener et al., 2009). One of the studies included in the meta-analysis (1) conducted mental status assessment. Reductions in functional capacity in the elderly compared to young adults with the effect of additional diseases cause mortality and many undesirable conditions. Only half of the elderly patients with hip fractures can reach their previous functional capacities after one year, and unfortunately 18.7% cannot be mobilized again (Eren, Koyuncu and Gönen, 2019; Vochteloo et al., 2013). In order for the results to be generalized, further studies are needed that examine groups of patients with common characteristics with a larger sample.

Conclusion

We conducted a study that can be a source for studies to be conducted to determine the effective risk factors for hip fracture formation and postoperative mortality that we often see in the elderly population in the world and in our country. In this study, it was concluded that experimental studies with a high level of evidence are needed.

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