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Epidemiology of Proximal Femural Fractures among the Elderly People of Almaty City

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Abstract

Background: Proximal femoral fractures are a global epidemiological concern due to their association with mortality and morbidity in the geriatric population.

Methods: We conducted an epidemiological study using hospital registry data to assess the incidence and associated factors of proximal femur fractures among individuals aged 60 years or older living in Almaty City. Student's t-test was used to assess for between-group differences.

Results: The data showed that the overall frequency of fractures among the population of Almaty City aged 60 years and older between 2014 and 2019 averaged 169.6 per 100,000, with a higher rate among women (190.3) compared to men (135.8). However, in age groups up to 70 years and over 85 years, the frequency of proximal femur fractures was higher among men. From 2014 to 2019, the incidence of proximal femur fractures increased by 1.6 times. An analysis of the distribution of fracture frequency by season revealed that winter was the most dangerous period.

Conclusion: Our research suggests a need for further epidemiological studies on the incidence of proximal femur fractures in various regions, identifying risk factors, and developing targeted regional prevention programs.

Keywords: Epidemiology, Fracture, Osteoporosis, Femur, Proximal Femur, Body Mass Index

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Introduction

Proximal femur fractures account for 15 to 55% of all fractures (1–3). Fractures of the femoral neck are observed in 50-55% of cases, and fractures of the trochanteric region occur in 30-40% (4-8).

Every year, the number of femoral fractures atincreases worldwide, and most of the affected individuals are the elderly, especially women (9-12). In 1990, there were 1,660,000 FRP fractures worldwide; their frequency is estimated to increase in 2050 to 6,260,000 per year (13).

Almsot 90% of trochanteric fractures were registered in patients with varying degrees of osteoporosis (14-16). With a decrease in bone mineral density, femoral fractures may occur even with a minor low-energy injury (17-19). On the other hand, aging of the population, which is typical for all countries of the world, including the Republic of Kazakhstan increases the necessity of a sound estimation of the rate of femoral fractures and their associated features.

Therefore, we aimed to assess the incidence of fractures

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↑What is "already known" in this topic:
Proximal femur fracture is a global epidemiological concern, it commonly occurs in geriatric patients and leads to high morbidity and mortality.

→What this article adds:
This research examined the occurrence of Proximal femoral fractures in individuals aged 60 years and above in Almaty City from 2014 to 2019. On average, there were 169.6 fractures per 100,000 cases. The majority of them are a result of domestic trauma, with women experiencing a higher incidence rate. Between 2014 and 2019, the frequency of fractures increased by 1.6 times. This study indicates the necessity of additional epidemiological research.

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of the proximal femur among individuals older than 60 years who live in Almaty, Kazakhstan, and to identify probable risk factors for fractures of proximal femur in this population.

Methods

We performed an epidemiological study using the data from the trauma departments of the City Clinical Hospital No. 4, City Clinical Hospital 7, Almaty, City Department of Statistics for Almaty. All patients older thahn 60 years who were hospitalized in City Clinical Hospital No. 4 trauma departments and City Clinical Hospital 7 of Almat in the period from January 1, 2014, to December 31, 2019, with proximal femur fracture were included.

The target population of the study were the residents of the city of Almaty aged 60 years and older, who accounted for 6.5% of the city's total population in 2019.

The research was carried out at the Department of Traumatology and Orthopaedics of KazNMU named after S.D.

When considering the causes of fractures, it is essential to consider the influence of various systemic diseases, which indirectly increase the risk of developing proximal femoral fractures. Thus, the data related to these underlying conditions as well as the immediate causes of fractures were collected. Seasonal fluctuations in the incidence of fractures at each fracture site were also recorded. These were used to identify a possible relationship between the incidence of proximal femoral fractures and the season of the year.

Descriptive statistical methods were used to present the data among different groups of patients. We used simple cross-tabulations and bar charts were used to present the data on the incidence of proximal femoral fractures in different demographic groups of the population. Two-tailed t-test with a 0.05 level of significance was employed to assess for betwee-group differences.

Results

A total of 54,252 people, including 20,625 men (38.0%) and 33,627 women (62.0%) of the city population was identified as the at-risk population(above 60 years old). During the study period, there were 297 cases of proximal fractures of the femur in persons 60 years of age and older, of which 102 fractures (34.3%) were in men and 195 (65.7%) in women in Almaty City.

The frequency of proximal fractures of the femur among men and period from 2014 to 2019 is shown in Figure 1. It was noted that the incidence of proximal fractures of the femur increased by 1.6 times over four years (1.5 times in men and 1.7 times in women). The average absolute number of fractures for one year in the city in people of this age was 74.2, 25.5 of which occurred in men and 48.7 in women. The distribution of patients with proximal fractures of the femur by sex and age from 2014 to 2019 is presented in Table 1 and Table 2.

In 80.0% of patients, domestic trauma was the cause of proximal fractures of the femur. Street injury was the culprit for 16.6% of cases, 3.4% of which were attributed to traffic injuries. The distribution of low-energy injuries by causes (in %) is shown in Figure 2. According to the figure, it can be noted that more than half (56%) of patients' household injuries were caused by a fall from the height of one's

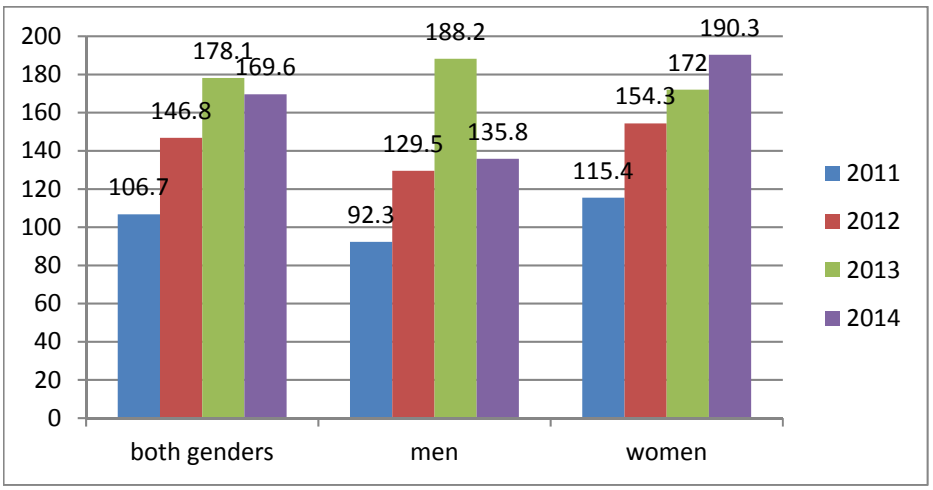

Figure 1. Relative incidence of proximal fractures of the femur in men and women aged 60 years and older depending on gender and age (per 100,000 persons of the corresponding population)

Table 1. Distribution of patients with proximal fractures of the femur by sex and age from 2014 to 2019

Age group	Men		Women		Total	
	N	Incidence (%)	N	Incidence (%)	N	Incidence (%)
60-64	22	7.3	8	2.7	30	10.1
65-69	20	6.7	17	5.7	37	12.5
70-74	17	5.7	42	27.6	59	19.9
75-79	14	5.4	51	6.8	65	21.9
80-84	17	5.7	45	16.0	62	20.9
85+	12	4.0	32	10.6	44	14.8
Total	102	34.3	195	65.7	297	100.0

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Table 2. The frequency of proximal fractures of the femur in different age groups by sex (per 1,000,000 persons of the corresponding population) in 2014

Age group	Both genders	Men	Women	The growth rate of each group compared to the previous one (both genders) (Percentage)
60-64	37.7±13.4	55.0±24.6	24.7±14.3	-
65-69	108.9±30.2	130.1±53.0	95.6±36.1	288.9
70-74	206.7±47.4	123.0±61.5	252.5±65.0	189.8
75-79	304.1±66.2	172.0±85.9	371.2±89.8	147.1
80-84	708.2±157.7	606.8±270.6	750.0±192.9	232.9
85+	511.2±153.7	760.5±236.6	430.5±162.3	72.2
Total	169.6±17.7	135.8±15.8	190.3±23.7	

height and while walking; in a third (32%) of patients, a fracture.

Regarding the seasonal variation in fracture rates, fractures were registered in 98 (32.9%) cases in Winter months, which is approximately two times the rate in the Summer months (15.3%) cases. In the spring period, 86 (28.9%) cases, and in autumn, 68 (22.9%) cases of fracture were observed (Figure 3). Thus, the vast majority (84.7%) of patients were injured during the cold seasons.

The average body mass index among the included patients was 21.6 kg/m^2. Fractures occurred in people with a BMI within the normal range.

Considering the underlying and comorbid conditions, 65% of patients had more than three concomitant diseases, 18% had two, and 17% had one disease each. The most common were diseases of the cardiovascular system in 263 (64.7%), respiratory in 49 (12.0%), and endocrine system in 17.0% of the patients. Of the diseases of the cardiovascular system, various forms of chronic coronary artery disease were the most commonly detected (in 62 cases), hypertension occurred in 68 patients, and obliterating atherosclerosis in 13 patients. The consequences of acute stroke occurred in 13% of patients, and encephalopathy occurred in 12%. Metabolic disorders which consisted of diabetes mellitus and obesity occurred in 13% and 4% of the patients respectively. Diseases of the gastrointestinal system affected 4.6% and neoplastic diseases 1.2% of patients with proximal fractures of the femur.

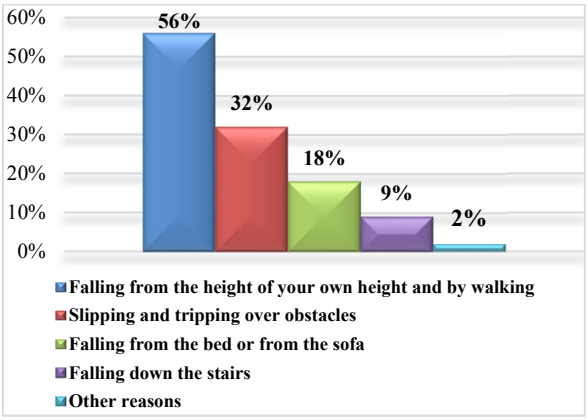

Figure 2. Distribution of low-energy injuries by causes, %

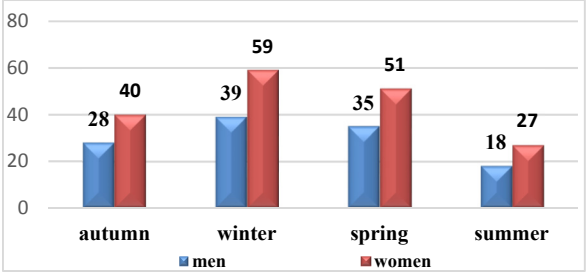

Figure 3. Distribution of injuries by seasons of the year depending on gender

Discussion

It is known that the vast majority of femoral fractures occur in the elderly. Hence, it is necessary to thoroughly assess the structure and frequency of these fractures and determine their dynamics in senior citizens. The current epidemiological study focused on the frequency of femoral fractures among the population of Almaty City, specifically in individuals aged 60 years and older from 2014 to 2019.

In terms of the dynamics of proximal fractures of the femur incidence, we observed a 1.6-fold increase in the frequency of PPBP from 2014 to 2019. The analysis of age-specific injury rates during the observation period revealed a significant growth in the frequency of proximal fractures of the femur up to the age of 80-84 years. The most significant growth was observed in the age group of 65-69 years, with a growth rate of 288.9%. A similar pattern was observed among the female population. In contrast, the frequency of proximal fractures of the femur among men steadily increased with age, except for the age group of 70-74 years, where the rate of proximal fractures of the femur was somewhat lower than the group of 65-69 year-olds. This finding is consistent with a similar study conducted in Ufa, Russian Federation, in 2000-2005, which also reported a higher incidence of proximal fractures of the femur among men in some age groups (20).

The overall fracture rate among the population aged 60 and over in 2019 was 169.6 per 100,000, with a similar rate observed in women (190.3) compared to men (135.8). However, we did not find a statistically significant difference in the frequency of proximal fractures of the femur by gender ($P > 0.05$). The coefficients we obtained partially coincide with the data from a similar study conducted in Ufa, Russian Federation, between 2000 and 2005. In our study, the ratio of injury frequency between men and women was 1:1.4, while the same analysis reported a ratio of 1:1.1. It is important to note that the incidence of injuries in our region was higher than in Ufa (129.8 prosantimilles), which may be attributed to the fact that the Russian survey group included persons over 50 years of age, while our

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study focused on individuals over 60 years of age (20).

Interestingly, a higher incidence rate was recorded among men in their sixties. However, women tend to predominate among the cases with proximal fractures of the femur in their seventies. Among people in their eighties, the frequency of injuries among men prevails again. This pattern was also consistent with the Russian study findings (20). The reason for this pattern is unclear. However, it may be evaluated from physiological and social standpoints.

The ratio of the relative incidence of fractures of this localization in men and women, according to researchers, was 3:1 in England (21), 4.5:1 in Italy (22), and 3.8:1 in Argentina (23). Many researchers have proven that the risk of developing these fractures is lower in Asian women than in Caucasian women (24).

The causes of low-energy injuries also differed between men and women. In men, the most common cause of household injuries was a fall from their own height, accounting for 35.3% of cases, followed by falls while walking (20.6%) and falls from a height greater than their own (15.7%). In contrast, women were more likely to experience fractures from falls while walking (42.6%) and falls from their own height (32.3%). These differences in the causes of low-energy injuries between men and women may be attributed to variations in physical activity levels, balance, and muscle strength and are consistent with previous studies (21).

Our data also revealed a statistical correlation between the frequency of proximal fractures of the femur and the year's seasons, with the most hazardous period being winter, and spring and autumn periods being relatively less hazardous. This finding is consistent with the general epidemiological situation for proximal fractures of the femur in many countries with a continental climate (25). Some authors attribute the frequency of fractures in winter and spring to low vitamin D3 synthesis (25), while others attribute it to decreased neuromuscular coordination and vitamin D deficiency (26). Studies conducted in Sweden (27, 28), Great Britain (29, 30), Australia (31), Italy (32), and the United States have also confirmed the seasonality of proximal fractures of the femur fluctuations (33, 34), although data from other studies are contradictory (35-39).

Many researchers who assessed patients' physical activity concluded that low physical activity in this category of patients is a risk factor for fractures (40-49). Increased physical activity of the elderly(walking, climbing stairs, housework, and gardening) is considered a protective measure against fractures (48), as active movements increase the load on the bone, which in turn increases bone mineral density. An increase in muscle mass also serves as protection against local impact (47-49).

Conclusion

The high incidence and variable pattern of proximal femoral fractures found in this study highlight the need for further epidemiological research on the incidence of these fractures in different regions. This research should focus on identifying sex-specific and age-specific risk factors for the subsequent development of targeted regional programs to prevent femoral fractures.

Conflict of Interests

The authors declare that they have no competing interests.

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