Demographic and clinical characteristics of traumatic shoulder dislocations in an eastern Anatolian city in Turkey: A retrospective single-centre analysis of 181 patients

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ABSTRACT

Objective: This study aims to investigate demographic and clinical characteristics of traumatic shoulder dislocations in an Eastern Anatolian city (Muş) in Turkey.

Material and Methods: Digital patient database was reviewed to identify the glenohumeral shoulder dislocations admitted to the emergency department between January 2017 and December 2018. Incidence, demographics, recurrence, associated injuries, and mechanism of injury were evaluated.

Results: One hundred and eighty-one patients (140 males, 41 females; mean age: 39.98±20.41 years) experienced traumatic shoulder dislocation during the study period. The incidence was 18,9 per 100,000 person-years. Age distribution peaked between 21 and 30 (94.5% male) and between 61 and 70 years. Primary shoulder dislocation occurred in 153, recurrent dislocations in 28, and anterior dislocations in 177 patients. The mechanism of injury included falls in 144 and sports injuries in 18 cases. The reduction was achieved in 154 patients in the emergency department.

Conclusion: The incidence of traumatic shoulder dislocations in Muş was higher than the study conducted in Turkey but similar to those in Europe, the UK, and the USA. Risk factors included young age (21-40) and participation in sports in men but fall and being in the 6th decade in women.

Keywords: Glenohumeral joint, shoulder dislocation, incidence.

INTRODUCTION

Shoulder dislocations and related instabilities are common causes of chronic shoulder pain and limitation of joint functions. Shoulders are the biggest joints with the highest dislocation frequency in the osteoarticular system in the human body. The majority of shoulder dislocations are anterior dislocations. Less frequently, posterior and inferior dislocations occur respectively (1).

It has been reported that the incidence of shoulder dislocation varies between 8.2-56.3 per 100,000 person-years (2,3). In the literature, there is a limited number of studies conducted on the Turkish population. Although there are many studies on this subject in the world, the majority of them are European and American studies.

We think that demographic and clinical features of shoulder dislocations in the literature show differences in both Turkish populations and in the region due to socio-cultural characteristics, behavioural changes in sports activities and lifestyle differences.

In this retrospective study, demographic and clinical characteristics of shoulder dislocation in an Eastern Anatolian city in Turkey will be discussed and compared with available literature.

MATERIAL and METHODS

Muş, located in the Eastern Anatolian region of Turkey, has a population of 407.992 according to 2018 census (**4**) (**Figure1**). There is only one state hospital in Muş city centre, Muş State Hospital which provides treatment for effectually all traumatic injuries in the city. Since this study is based on non-invasive and retrospective clinical research, ethics committee approval could not be taken; however, administrative permission certificate related to the study was obtained from the hospital and all the conditions of the Helsinki Declaration were respected during the course of the study.

Patient data from January 2017 to December 2018 were reviewed retrospectively. The data of a total of 306 patients were obtained from the database with the diagnosis in the ICD-10 classification system including M24.3 (Pathological dislocation and subluxation of joints, not elsewhere classified), M24.4 (Recurrent dislocation and subluxation of joint), S43.0 (Dislocation of shoulder joint), S43.3 (Dislocation of other and unspecified parts of shoulder girdle) and S43.4 (Sprain and strain of shoulder joint). The radiological images and epicrisis information of the patients recorded in the PACS system (picture archiving and communication system) were examined one by one. 125 patients with no radiological imaging of shoulder dislocation were excluded from the study. During the examination, the data of 181 patients were examined and the demographic characteristics of the patients, the type of dislocations, the presence of additional injuries, the etiology of the dislocations, the presence of recurrent dislocations, the length of hospital stay, and the place of dislocation reduction were evaluated. The patients with suspicious information in their records were contacted to confirm the data. Radiographic images and epicrisis information of the patients were evaluated by two orthopaedic surgeons. The patients were grouped as under 20 years of age and over 80 years of age and were evaluated as decades between 20-80 years of age.

Statistical Analyzes: Statistical analyses were performed using SPSS software (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). The conformity of the numerical variables to the normal distribution was performed using visual (histogram and probability graphs) and analytical methods (Kolmogorov-Smirnov/ShapiroWilk tests). While the descriptive statistics for the numerical variables which showed normal distribution in the comparisons were given by mean and standard deviation, the descriptive statistics of the numerical variables not showing normal distribution were given with median and interquartile values. Descriptive statistics of categorical variables were given using numbers and percentage values. The Mann-Whitney U test was used to compare two groups with at least one non-normal distribution. Chi-square or Fisher tests were used according to the smallest expected value and the expected value in the comparison of two categorically independent groups. Kruskal-Wallis test was used to compare three groups with at least one not showing normal distribution. Statistical significance level was accepted as $p<0.05$.

RESULTS

There were 140 (77.3%) male and 41 (22.6%) female patients with a mean age of 37.2±21.3. The median age was 39,9 (range: 12 to 93) years. More than half of patients (59.6%) were under 40 years of age. The average age of the male and female patients was 66±25.5, and 28±20.7, respectively ($p<0.0001$). Incidence according to age peaked at two points; age 21 to 30 years (94.5% male) and 61 to70 years (50% female). The male/female ratio was 3.4/1. The overall incidence of shoulder dislocations during the study period was 22.4 per 100,000 person-years (male: 17.3 per 100,000 person-years, female: 5.1 per 100,000 per person-years). The incidence of primary shoulder dislocations was 18,9 per 100,000 person-years (male: 14.4 per 100,000 person-years, female: 4.4 per 100,000 person-years). One hundred and fifty-three patients (84.5%) had primary shoulder dislocations, while 28 patients (15.4%) had recurrent shoulder dislocations (**Figure2**). The mean number of previous episodes of dislocations was 3.2±1.9 (range: 2 to 8). Patients with recurrent shoulder dislocations were younger than those with primary dislocations (mean age, 29,86±13,93 and 41,84±20,9, respectively; $p=0.004$). The distribution of gender among patients with primary and recurrent dislocations was similar ($p=0.072$) (**Table 1**).

There were 177 (97.7%) anterior dislocations, 3 (1.65%) posterior dislocations and 1 (0.55%) inferior dislocation (luxatio erecta) (**Figure 3**). Dislocations occurred in the right shoulder in 95 (52.5%) cases and in the left shoulder in 85 (46.9%) cases. The simultaneous bilateral anterior dislocation was identified in 1 (0.55%) case. There was no significant difference in the incidence of dislocations in the right and left extremities ($p>0.05$). Considering the months when the patients were admitted to the hospital and grouped according to the seasons, 51 (28,1%) patients were admitted to the hospital in spring, 51 (28.1%) in summer, 41 (22.6%) in autumn and 38 (20.9%) in winter (**Figure 4**). No statistically significant difference was found between the seasons ($p>0.05$). The mechanism of injury was falling in 144 (79.5%) cases, sports injuries in 18 (9.9%), traffic accidents in 16 (8.8%) and epileptic seizure in 3 (1.6%) cases. The injury mechanism was similar between age groups ($p=0.786$), but statistically different between genders ($p=0.008$) (**Table2**). 156 patients (86.1%) presented with isolated shoulder dislocation. In addition to shoulder dislocation, 3 (1.6%) patients had proximal humerus fracture, 18 (9.9%) had fracture of the greater tuberosity (**Figure 5**), 1 (0.55%) had scapula fracture, 1 (0.55%) had clavicle fracture, 1 (0.55%) had acromion fracture and 1 (0.55%) had coracoid fracture. Of 18 cases with fractures of the greater tuberosity, 13 (72.2%) were older than 50 years of age. The fracture of the greater tuberosity was more common in the older age groups ($p=0.0001$). The mean age of patients with isolated dislocation was found to be younger ($p=0.009$). Initially, the reduction was attempted in the Emergency Department (ED) under conscious sedation in all patients. A successful reduction could be achieved in 154 patients (85.1%). However, 27 patients (14.9%) required general anaesthesia for reduction. The success rate in the ED was similar between primary and recurrent dislocations ($p=0.283$).
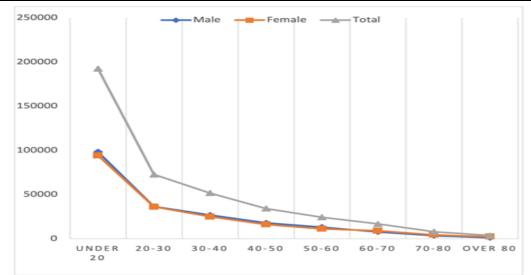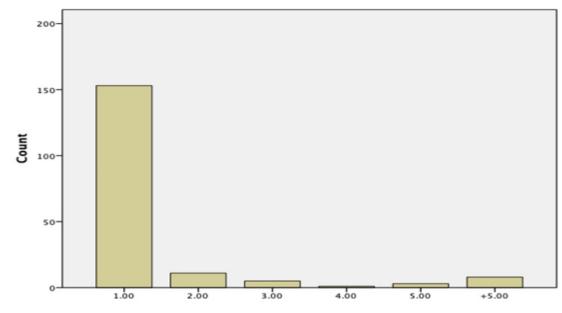
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Figure 1. Demographic data of Muş in 2018.

Figure 2. Distribution of the patients according to the number of dislocations.

Table 1. Distribution dislocations according to the age groups.

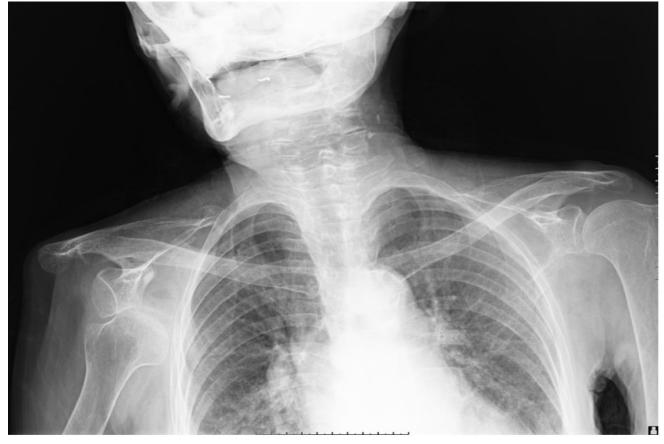| Age Groups	Recurrent Dislocation		First Dislocation		
	Male	**Female**	**Male**	**Female**	**Total**
Under 20	4	2	18	0	24
Between 20-30	12	1	40	2	55
Between 30-40	4	1	22	2	29
Between 40-50	0	0	17	5	22
Between 50-60	2	0	4	1	7
Between 60-70	1	1	11	11	24
Between 70-80	0	0	4	9	13
Over 80	0	0	1	6	7
Total	**23**	**5**	**117**	**36**	**181**
Average age (year)±SD	**29,86±13,93**		**41,84±20,9**		

Figure 3. Inferior shoulder dislocation of a 75-year-old female patient after falling.
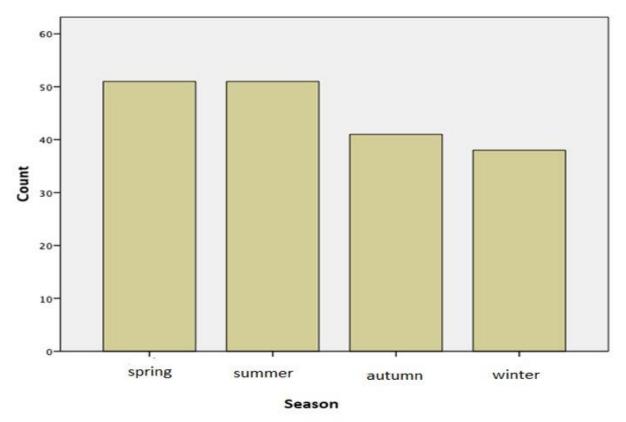

Figure 4. Distribution of patients according to seasons.

Figure 5. Tuberculum majus fracture and shoulder dislocation of a 20-year-old male patient after falling.

DISCUSSION

This study aims to determine the demographic and clinical characteristics of shoulder dislocations in an Eastern Anatolian city in Turkey. There is only one study reported in the literature on the incidence and demographic characteristics of shoulder dislocations on the Turkish population (5). However, the majority of the studies in the literature were conducted on American, British, and European populations.

In a study conducted in the United States, 124 patients were included in the study using the data between 1970 and 1979, the incidence of shoulder dislocation was found as 11.2/100,000 person-years (2). In another study conducted in the USA by Zacchilli et al. (6), a total of 8940 shoulder dislocations were included in the study using the data from 2002 to 2006 and the incidence of shoulder dislocation was 23.9/100,000 person-years. Szyluk et al. (7) reported the incidence of shoulder dislocation between the years 2010 and 2015 as 26.69/100,000 person-years. In a study in Denmark by Kroner et al. (8), the incidence of shoulder dislocation between 1980-1984 was 17/100,000 person-years.

In a study in Norway by Liavaag et al. (3), the shoulder dislocation incidence between 2009 and 2010 was 56.3/100,000 person-years. The incidence of shoulder dislocation between 2008 and 2010 in a study conducted in Turkey by Tafi et al. (5) was 5.3/100,000 person-years. The 22.4 per 100,000 person-years incidence of traumatic shoulder dislocations in our study was much higher than the previous study conducted in Turkey but similar to European and American studies.

Gender and age have been shown as the two most significant risk factors for traumatic shoulder dislocations. Shoulder dislocation can occur in all age groups. A study conducted by Hazmy et al. (9) revealed that reproductive age (21-40 years) and participation in sports were risk factors in men and being over 40 years of age and falls were the risk factors to develop shoulder dislocation in women. Owens et al. (10) carried out a study in predominantly young male military personals and the incidence of shoulder dislocations was found 169 per 100,000 person-years. The incidence rate is higher in physically active young males who are more frequently exposed to trauma. In our study, shoulder dislocations had a bimodal distribution with two peaks of incidence (**Figure 6**).
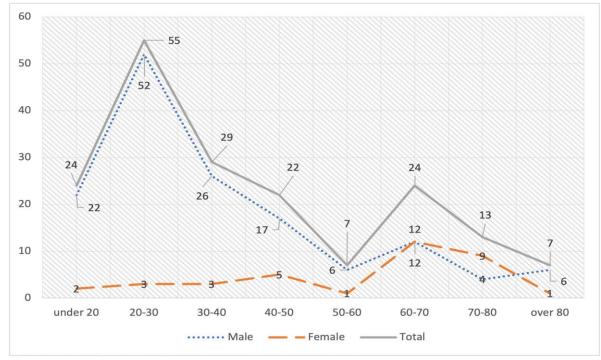
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Figure 6. Distribution of shoulder dislocation according to age and gender.

Table 2. Distribution of dislocation mechanism according to the age groups.

Age Groups	Falling		Traffic Accident		Sports Injury		Epilepsy		
	M	F	M	F	M	F	M	F	Total
Under 20	18	2	1	0	3	0	0	0	24
Between 20-30	39	2	3	0	9	0	1	1	55
Between 30-40	19	2	1	0	5	1	1	0	29
Between 40-50	13	5	4	0	0	0	0	0	22
Between 50-60	5	1	1	0	0	0	0	0	7
Between 60-70	7	12	5	0	0	0	0	0	24
Between 70-80	3	9	1	0	0	0	0	0	13
Over 80	1	6	0	0	0	0	0	0	7
Total	144		16		18		3		181

Males constituted the majority of the cases in the 3rd decade of life and females in the 6th decade. This particular pattern has been identified in nearly all previously conducted studies (2,3,5,6,8). Nevertheless, the age range in the second peak was lower in our country. The second peak of incidence was seen in patients older than 80 years in Norway (3) and between 80 to 89 years of age in Zacchilli's study in the USA (6). This diversity can also be explained by the differences in the population pyramid and the lower average life expectancy in our country. A study conducted in Denmark (8) and another study in a large population-based cohort of 16.763 patients aged 16–70 years in the UK during 1995-2015 (11) identified the bimodal age distribution of incidence and also specifically noted that older people most frequently dislocated their shoulder at home by falling on their arm, whereas young people most frequently suffered a shoulder dislocation while playing sports.

The reason behind the second peak of incidence in elderly women in the general population is not so clear. Nordqvist et al. (12), Tafi et al. (5) and Liavaag et al. (3) proposed that the increased incidence of falls in this age group is the major reason behind the second peak. Shoulder dislocations in the elderly are generally associated with rotator cuff tears and fractures with following loss of function as well as instability. However, further work is needed to analyze the reasons that may support this increased risk of shoulder dislocations in aging women. Possible reasons include biological differences between aging men and women such as differences in joint proprioception, soft tissue tendon quality, protective muscle size, or whether there is a difference in the incidence of falls between men and women (11). Falls were responsible for 79.5% of all cases in our study. There was a distinct variation between genders regarding the mechanism of injury. In females, falls were responsible for nearly all cases. In addition to falls, sporting activities and traffic accidents were other significant causes of shoulder dislocation in males (**Table 2**).

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In Muş, because of the sociocultural structure of the community, a large proportion of women are housewives. Hence, the relatively low participation of women in the workforce and sporting activities may explain the differences in the mechanism of injury in males and females. Similarly, Zacchilli & Owen reported that males had a significantly higher proportion of sports or recreation-related dislocations than females and that younger age groups had a significantly higher proportion than the older age groups (6). On the other hand, Krøner et al. could not show any difference in the mechanism of injury between genders (8).

Several studies have revealed that the age at the time of primary dislocation is the most important prognostic factor in determining the risk of recurrence (13,14,15,16). te Slaa et al., in their study, found a radiolocation rate of 64% for cases under the age of 20 and 4% for those over 40 (14). In a retrospective analysis of 488 cases with a follow-up duration of 20 years, Rowe reported 83% recurrence rate for cases below the age of 20 and 16% for those above the age of 40 (17). Hovelius et al. followed up 255 patients with 257 primary shoulder dislocations for two years in a multicentre study in Sweden and reported 47% recurrence rate in patients with 22 years of age or younger (8). The study conducted by Tafi et al. (5) in Turkey revealed that recurrent dislocations constituted 17% of 208 patients and patients with recurrent dislocations were reported to be younger than those with primary dislocations (mean age, 29.7±14.5 and 38.8±22.2, respectively). In our study, recurrent dislocations constituted 15.4% of the cases. Patients with recurrent shoulder dislocations were younger than those with primary dislocations (mean age, 29,86±13,93 and 41,84±20,9, respectively; p=0.004).

Analysis of incidence figures in particular months of the year shows a significantly higher incidence in the winter months, with a peak in January (7). On the contrary, in our study, 38 (20.9%) patients were admitted to the hospital in the winter season. In our opinion, adverse weather conditions and economic difficulties in rural areas in Muş prevent people from accessing health services in winter. Also, we think some of the patients with dislocated shoulders were treated by traditional bonesetters. Hovelius et al. (16) stated that nearly 50% of the people with primary dislocations never visited hospitals nor were treated by a physician. Therefore, we explain the low rate of shoulder dislocations in winter due to not reaching the hospital in Muş.

The majority of studies showed an overall predominance of anterior directionality, followed by posterior and inferior directions (8, 19, 20). Krøner et al. (8), Rowe (17), Owen et al. (20) and Tafi et al. (5) reported anterior shoulder dislocations by 97.2%, 98%, 94% and 93.4%, respectively. Similar to the literature, anterior dislocations constituted 97.7% of cases in our study. te Slaa et al. and Hovelius et al. reported that bilateral dislocations composed 12% and 9% of all the cases, respectively (14, 19). Contrary to this finding, bilateral anterior dislocation was identified in only 1 case (0.5%) in our study.

In a study of 500 shoulder dislocations, fractures of the shoulder girdle, being more common in older population, were associated with dislocation in 122 (24%) and with fractures of the greater tuberosity in 75 (15%) cases. In the same study, other fractures (surgical neck, clavicle, scapula and acromion) were associated with dislocation in 10 (2%) cases (17). Tafi et al. (5) reported that 10.6% of cases had fractures of the greater tuberosity which were more common in the older population. In our study, the majority of shoulder dislocations (86.1%) were isolated dislocations without an accompanying fracture. In addition to shoulder dislocation, 3 (1.6%) patients had proximal humerus fracture, 18 (9.9%) had tuberculum majus fracture and 4 (2.2%) had other fractures similar to Rowe's study (17) and were more common in the older population of our study.

All patients included in our study were diagnosed with shoulder dislocations verified by radiographs and clinical records. The radiographs were determined by two orthopaedic surgeons. This enabled eliminating any inappropriate clinical records or misdiagnosis. The data obtained in the study provided detailed information about several characteristics of shoulder dislocations such as the direction of dislocations, recurrence, associated injuries, and etiology. Yet, our study had some limitations as well. First, our findings cannot be generalized to Turkey due to the distinct demographic characteristics of the region where the study was conducted. Secondly, a tiny decrease in annual incidence might be expected in a real situation as additional patients with shoulder dislocations might have been coded with a false ICD-10 code in our clinical databases. Finally, there is only one private hospital in Muş that usually provides treatment for a small number of patients with shoulder dislocations.

CONCLUSION

In conclusion, the overall incidence of primary shoulder dislocations was 22.4 per 100,000 person-years in Muş. Our findings were similar to the European and American studies but different from the other study conducted in Turkey. Age and gender-specific distribution of shoulder dislocations showed two peaks of incidence in young males and elderly women. The incidence in males, which constituted the majority of the cases, was 3.4 times that of females. We believe that the current study will provide additional knowledge and outline the demographic characteristics of primary shoulder dislocations in Turkey. Consequently, it is required to study changes in the incidence of shoulder joint dislocations over time with regular updates and to monitor this problem in the general population to make our understanding more accurate.

Author contributions: ÖC, FD; Literature search and study design, Data collection, patient examination and therapy ÖC; Writing article and revisions

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Ethical issues: All authors declare originality of research.

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