



# Demographic and clinical characteristics of traumatic shoulder dislocations in an urban city of Turkey: a retrospective analysis of 208 cases

Mahmut TAŞ<sup>1</sup>, M. Kerem CANBORA<sup>2</sup>, Özkan KÖSE<sup>3</sup>, Ömer Faruk EĞERCİ<sup>3</sup>, Mehmet GEM<sup>4</sup>

<sup>1</sup>*Emergency Department, Diyarbakır Training and Research Hospital, Diyarbakır, Turkey;*

<sup>2</sup>*Department of Orthopedics and Traumatology, Haydarpaşa Numune Training and Research Hospital, İstanbul, Turkey;*

<sup>3</sup>*Department of Orthopedics and Traumatology, Antalya Training and Research Hospital, Antalya, Turkey;*

<sup>4</sup>*Department of Orthopedics and Traumatology, Faculty of Medicine, Dicle University, Diyarbakır, Turkey*

**Objective:** The aim of this study was to investigate the demographic and clinical characteristics of traumatic shoulder dislocations in an urban city of Turkey.

**Methods:** The digital patient database was reviewed to identify all patients with glenohumeral dislocation of the shoulder admitted to the emergency departments of the two hospitals in Diyarbakır between January 2008 and December 2010. Incidence, demographics, clinical characteristics, recurrence, associated injuries, and mechanism of injury were evaluated.

**Results:** Two hundred and eight patients (163 male, 45 female; mean age: 37.2±21.3) experienced traumatic shoulder dislocation during the study period. The overall incidence of primary shoulder dislocations was 5.3 per 100,000 person-years. Age distribution peaked between 21 and 30 years (96.5% male) and between 61 and 70 years (66.7% female). Primary shoulder dislocation occurred in 172 patients (82.7%) and recurrent dislocations in 36 (17.3%). Patients with recurrent shoulder dislocations were younger than those with primary dislocations (mean age, 29.7±14.5 and 38.8±22.2, respectively; p=0.020). There were 195 (93.4%) anterior dislocations. The mechanism of injury was falls in 155 (74.5%) cases. Reduction was achieved in 165 patients (79.3%) in the emergency department. General anesthesia was used for 43 patients (20.7%).

**Conclusion:** The 5.3 per 100,000 person-years incidence of traumatic shoulder dislocations in Turkey was much lower than previous studies. Demographic characteristics also showed various differences closely related to the population pyramid.

**Key words:** Epidemiology; glenohumeral joint; shoulder dislocation.

Glenohumeral dislocation is the most common type of joint dislocation in the body and is the leading cause of shoulder instability.<sup>[1]</sup> Although the evaluation and treatment of shoulder dislocations are well-studied and delineated, there is limited information regarding the incidence and epidemiology of shoulder dislocations in

the relevant literature. The incidence of shoulder dislocations in general population in previous studies vary between 8.2 and 56.3 per 100,000 person-years.<sup>[2-6]</sup>

The majority of information on the epidemiology of shoulder dislocations originates from European and American societies and no reports on the Turkish pop-

**Correspondence:** Özkan Köse, MD. Kültür Mah. 3805. Sk. Durukent Sitesi F Blok Daire: 22 Kepez, Antalya, Turkey.

Tel: +90 242 - 249 44 00 e-mail: drozkankose@hotmail.com

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ulation have been published. Demographic and clinical characteristics of shoulder dislocations may vary according to geographic, ethnic, and sociocultural differences. We hypothesized that the epidemiology of shoulder dislocations in Turkey is different from European and American data.

The purpose of this retrospective study was to investigate the demographic and clinical characteristics of traumatic shoulder dislocations in an urban city of Turkey and discuss our findings with the current data.

## Patients and methods

Diyarbakır, one of the largest cities in southwest Turkey, has a population of 1,090,172 according to the 2010 census.<sup>[7]</sup> There are two public hospitals in the city center, Diyarbakır Training and Research Hospital and Dicle University Faculty of Medicine, which provide treatment for virtually all traumatic injuries in the city. All data were received without personal identification and conducted according to the Declaration of Helsinki regulations.

The digital patient database was retrospectively reviewed using ICD-10 coding to identify all the patients with glenohumeral dislocation of the shoulder (ICD-10 code: M24.31 and M24.41) admitted to the emergency departments (ED) of the two hospitals between January 2008 and December 2010. All radiologic imaging files and medical records of these patients were obtained from the Picture Archiving and Communication System (PACS) and clinical database. Medical records were used to extract demographic information, history, clinical findings, mechanism of injury, additional injuries, and interventions performed at the ED.

Images were evaluated independently by two orthopedic surgeons to classify the direction of dislocation and additional osseous injuries around the shoulder joint. Any discrepancy was subsequently resolved by consensus. Two hundred and twenty-three shoulder dislocations were identified. Six were excluded due to false ICD-10 coding. Of the remaining patients, four had acromioclavicular dislocation alone and two had proximal humeral fracture dislocations. Three other patients lacked initial radiographs showing the dislocation. Finally, 208 patients with a definite diagnosis of shoulder dislocation were included in the study. Demographic data on Diyarbakır was obtained from the Turkish Statistical Institute to determine the incidence of shoulder dislocations.<sup>[7]</sup>

A descriptive analysis of continuous and categorical data was performed using proportions, frequency distributions, means and standard deviations. The Student's

t-test was used to compare independent groups and the chi-square test to analyze the distribution of categorical data. A p value of less than 0.05 was considered statistically significant.

## Results

There were 163 (78.4%) male and 45 (21.6%) female patients with a mean age of  $37.2 \pm 21.3$ . The median age was 29 (range: 5 to 88) years. More than half of patients (57.4%) were between 16 and 36 years of age. The average age of the male and female patients was  $30.9 \pm 17.0$  and  $59.9 \pm 19.9$ , respectively ( $p=0.0001$ ). Incidence according to age peaked at two points; age 21 to 30 years (96.5% male) and 61 to 70 years (66.7% female) (Fig. 1). The male/female ratio was 3.6/1.

The overall incidence of shoulder dislocations during the study period was 6.45 per 100,000 person-years (male: 9.96 per 100,000 person-years, female: 2.84 per 100,000 per person-years). The incidence of primary shoulder dislocations was 5.34 per 100,000 person-years (male: 8.0 per 100,000 person-years, female: 2.58 per 100,000 person-years).

One hundred and seventy-two patients (82.7%) had primary shoulder dislocation, while 36 patients (17.3%) had recurrent shoulder dislocations. The mean number of previous episodes of dislocations was  $3.1 \pm 1.8$  (range: 2 to 10). Patients with recurrent shoulder dislocations were younger than those with primary dislocations (mean age,  $29.7 \pm 14.5$  and  $38.8 \pm 22.2$ , respectively;  $p=0.020$ ). The distribution of gender among patients with primary and recurrent dislocations was similar ( $p=0.066$ ) (Table 1).

There were 195 (93.4%) anterior dislocations, 9 (4.3%) posterior dislocations and 4 (1.9%) inferior dislocations (luxatio erecta). Dislocations occurred in the

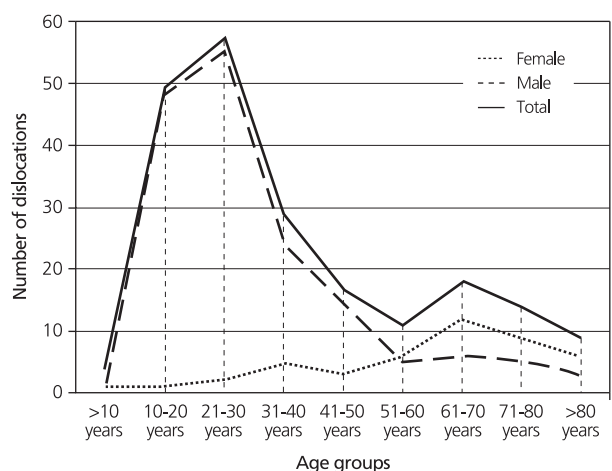


Fig. 1. The distribution of shoulder dislocations by age and gender.

**Table 1.** The distribution of gender among patients with recurrent and primary dislocations.

Age groups	Recurrent dislocations		First time dislocations		Total
	Male	Female	Male	Female	
<10 years	-	-	3	1	4
10-20 years	11	-	37	1	49
21-30 years	12	-	43	2	57
31-40 years	5	2	19	3	29
41-50 years	4	-	10	3	17
51-60 years	-	-	5	6	11
61-70 years	-	1	6	11	18
71-80 years	-	1	5	8	14
> 80 years	-	-	3	6	9
Total	32	4	131	41	208
Mean age in years±SD	29.7±14.5		38.8±22.2		

right shoulder in 133 (63.9%) cases and the left in 73 (35.1%). Simultaneous bilateral anterior dislocation was identified in 2 (1%) cases (Fig. 2). The right shoulder was more frequently affected than the left shoulder ( $p=0.001$ ).

The mechanism of injury was falls in 155 (74.5%) cases, sports trauma in 26 (12.5%), motor vehicle accidents in 18 (8.7%), physical assault in 6 (2.9%) and epileptic seizure in 3 (1.4%). Injury mechanism was similar between age groups ( $p=0.876$ ), but statistically different between genders ( $p=0.009$ ) (Table 2).

In 184 cases (88.5%), there were no accompanying fractures and 22 (10.6%) cases had simultaneous fracture of the greater tuberosity (Fig. 3). One patient had an accompanying clavicular fracture and one an associated acromioclavicular Type 3 separation. Of 22 cases with fractures of the greater tuberosity, 16 (72.7%) were older than 50 years of age. The fracture of the greater tuberosity was more common in the older age groups ( $p=0.0001$ ).

**Fig. 2.** The chest X-ray of a 54-year-old female patient with bilateral anterior shoulder dislocations.

Initially, reduction was attempted in the ED under conscious sedation in all patients. A successful reduction could be achieved in 165 patients (79.3%). However, 43 patients (20.7%) required general anesthesia for reduction. The rate of success in the ED was similar between primary and recurrent dislocations ( $p=0.247$ ).

**Table 2.** Cross tabulation of age groups with gender and mechanism of injury.

Age groups	Fall		Traffic accident		Physical assault		Sport injury		Epilepsy	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
<10 years	2	1	1	-	-	-	-	-	-	-
10-20 years	34	1	3	-	2	-	8	-	1	-
21-30 years	36	2	6	-	2	-	10	1	1	-
31-40 years	15	5	1	-	1	-	6	-	1	-
41-50 years	9	3	3	-	1	-	1	-	-	-
51-60 years	3	6	2	-	-	-	-	-	-	-
61-70 years	6	11	-	1	-	-	-	-	-	-
71-80 years	4	8	1	-	-	-	-	-	-	-
> 80 years	3	6	-	-	-	-	-	-	-	-
Total	112	43	17	1	6	-	25	1	3	-

**Discussion**

This study investigated the incidence and demographic characteristics of traumatic shoulder dislocations in an urban city in Turkey. To the best of our knowledge, this is the first study reporting incidence and demographic characteristics in the Turkish population. The incidence of shoulder dislocations in European populations (Denmark, Sweden, and Norway) has been reported between 17 to 56.3 per 100,000 person-years.<sup>[3,4,6]</sup> The incidence of shoulder dislocations in the American population has been reported between 8.2 and 23.9 per 100,000 person-years.<sup>[2,5]</sup> The incidence of traumatic shoulder dislocations in our country was 5.3 per 100,000 person-years which is much lower than what was found in previous studies (Table 3).

There are some possible explanations for the discrepancy between our findings and previous studies. Incidence is the measure of the rate of occurrence of new cases of a given disease per unit time, within a specified population. The numerator is the number of new cases and the denominator is the number of persons at risk of acquiring the disease; and in practice, the total population is often used.<sup>[8]</sup> The total population was used in the calculation of the incidence of shoulder dislocations in the current study. However, Diyarbakir has a relatively young population, with 37.2% of the population under the age of 15 according to the 2009 census.<sup>[7]</sup> Although shoulder dislocation can occur in all age groups, it is more common in patients between 20 and 40 years of age.<sup>[9]</sup> Therefore, demographic characteristics, particularly the population pyramid, should be taken into consideration in the evaluation of incidence studies. Furthermore, some cases may experience shoulder trauma outside their city of residence



**Fig. 3.** Anteroposterior shoulder radiograph of a 62-year-old female patient with anterior shoulder dislocation associated with fracture of the greater tuberosity (arrow).

and be treated at different hospitals. Finally, populations vary greatly in their attitudes and habits in seeking medical attention. This study could not include patients who failed to seek formal medical care. Likewise, Hovelius found that 50% of cases with primary dislocation did not present to a hospital/clinic or a health care provider in a study conducted using a random interview of 2092 Swedes in 1979.<sup>[10]</sup>

Although the incidence of shoulder dislocations was low in the current study compared to previous studies, demographic and clinical characteristics were similar in several respects. Age and gender has been shown to be the two most significant risk factors for traumatic shoul-

**Table 3.** Previously published studies on the incidence of shoulder dislocations in general population in English literature.

Author&year	Place	Study period	Population at risk	Incidence rate (100.000 person-years)		Age (years)
				Primary	All	
Simonet et al. <sup>[2]</sup> (1984)	Olmstead, USA General urban	1970-1979 (10 years)	880,000	8.2	11.2	(Mean) 36.4
Krøner et al. <sup>[3]</sup> (1984)	Aarhus, Denmark General urban	1980-1984 (5 years)	1,268,765	12.3	17	(Median) 51
Nordqvist and Petersson <sup>[4]</sup> (1984)	Malmö, Sweden General urban	1987 (1 year)	230,056	23.9	NA	(Median) Female 63 Male 44
Zacchilli and Owens <sup>[5]</sup> (2010)	USA electronic database General urban	(2002-2006) (5 years)	1.46 billion	NA	23.9	(Mean) 35.4
Liavaag et al. <sup>[6]</sup> (2011)	Oslo, Norway General urban	2009-2010 (1 year)	575,475	26.2	56.3	(Median) 34
Current study	Diyarbakir, Turkey General urban	2008-2010 (3 years)	1,090,172	5.3	6.4	(Median) 29

der dislocations. In our study, shoulder dislocations had a bimodal distribution with two peaks of incidence. 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 almost all previously conducted studies and our results were consistent with these findings.<sup>[2,3,5,6]</sup> However, 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<sup>[6]</sup> and between 80 to 89 years of age in Zacchilli and Owens's study in USA.<sup>[5]</sup> This discrepancy can also be explained by the differences in the population pyramid. The average life expectancy is much lower in our country. We can conclude that incidence rate by age and gender is strictly related to the population pyramid of the population under study.

Owens et al.<sup>[1,9]</sup> carried out two incidence studies in a selected physically active population (military personnel) of predominantly young males. The incidence of shoulder dislocations was 169 and 435 per 100,000 person-years. It comes as no surprise that incidence rate is higher in physically active young males who are more frequently exposed to trauma. The reason behind the second peak of incidence in elderly women in the general population is not so clear. Nordqvist et al. and Liavaag et al. proposed that the increased incidence of falls in this age group is the major reason behind the second peak.<sup>[4,6]</sup>

Falls were responsible for 75% of all cases in our study. There was a distinct variation between genders regarding the mechanism of injury. In females, falls were responsible for almost all cases. In males, sporting activities, traffic accidents and physical assault were other significant causes of dislocation, in addition to falls. In Diyarbakır, due to the sociocultural structure of the community, a large proportion of women are housewives. Therefore, the relatively low participation of women in the workforce and sporting activities may explain the differences in mechanism of injury in male and females. Similarly, Zacchilli and Owens 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.<sup>[5]</sup> On the other hand, Krøner et al. could not show any difference in mechanism of injury between genders.<sup>[3]</sup>

In our study, recurrent dislocations constituted 17% of the cases. Several studies have found the age at the time of primary dislocation to be the most important prognostic factor in determining the risk of recurrence.<sup>[1,9,11-13]</sup> In a retrospective analysis of 488 cases with a follow-up duration of 20 years, Rowe reported that recurrence rate was 83% for cases below the age of 20

and 16% for those above the age of 40.<sup>[11]</sup> Moreover, te Slaa et al. reported a radiolocation rate of 64% for cases below the age of 20 and 4% for those over 40.<sup>[13]</sup> Although our study is not a prospective follow-up study and the risk of recurrent dislocation in patients with primary dislocation is unknown, it can be reported that patients with recurrent dislocations were younger than primary dislocations (mean age,  $29.7 \pm 14.5$  and  $38.8 \pm 22.2$ , respectively).

Anterior dislocation is the most common type of dislocation in the glenohumeral joint, followed by posterior and inferior (luxatio erecta) dislocations.<sup>[12]</sup> Krøner et al. reported that 97.2% of all shoulder dislocations were anterior.<sup>[3]</sup> Likewise, anterior dislocations constituted 93.4% of cases in our study. Hovelius et al. and te Slaa et al. reported that bilateral dislocations composed 12% and 9% of all the cases, respectively.<sup>[12,13]</sup> Contrary to this finding, bilateral anterior dislocations were identified in only 2 cases (1%) in our study. In one of the cases, bilateral dislocation was caused by epileptic seizure. Although rarely seen, epileptic seizure cause forceful contraction of muscles around the shoulder girdle bilateral shoulder dislocation may occur.<sup>[14]</sup>

Fractures of the greater tuberosity may accompany anterior shoulder dislocations. Rowe reported that 15% of cases had associated fractures of the greater tuberosity and that they were more common in the older population.<sup>[11]</sup> On the other hand, Kralinger et al. and Hoelen et al. stressed that the incidence of fractures of the greater tuberosity was not associated with age.<sup>[15,16]</sup> In our study, the majority of shoulder dislocations (88.5%) were pure dislocations without an accompanying fracture. Fractures of the greater tuberosity constituted 10.6% of the study population. Similar to what was reported in Rowe's study, fractures of the greater tuberosity accompanying anterior shoulder dislocations were more common in the older population of our study (almost three fourth of the cases).<sup>[11]</sup> We believe that increased fragility and osteoporosis in the elderly is a risk factor for fractures of the greater tuberosity associated with shoulder dislocations. Furthermore, Rowe<sup>[11]</sup> found a low incidence of recurrence in fractures of greater tuberosity. He proposed that increased hemorrhage and soft tissue injury in these patients increase healing potential and scar-tissue formation which subsequently prevent recurrence. However, it is not clear whether this is related to increased scar formation or incidence of recurrence in older age groups.

All patients in this study had a definitive diagnosis of shoulder dislocation verified by radiographs and clinical records available from all patients. Furthermore, all radi-

ographs were evaluated by two orthopedic surgeons. Therefore, any misdiagnosis or inappropriate clinical records were eliminated. Our data provided detailed information about several characteristics of shoulder dislocations including direction of dislocation, recurrence, associated injuries, and etiology. Despite its strengths, our study had some limitations as well. First, our findings cannot be generalized to Turkey due to distinct regional differences in demographic characteristics. Second, as there are 5 private hospitals in Diyarbakır which usually provide treatment for elective (non-emergency) cases at which a small number of patients with shoulder dislocations may have been admitted. Finally, a negligible decrease in annual incidence might be expected in a real situation as additional patients with shoulder dislocation who were coded with a false ICD-10 code in our clinical databases might exist.

In conclusion, the incidence of primary shoulder dislocations was 5.3 per 100,000 person-years in Diyarbakır. Age and gender specific distribution of shoulder dislocations showed two peaks of incidence; in young males and elderly women. Male patients constituted the majority of the cases and the incidence in males was almost three times that of females. Our findings were different from findings of the European and American populations. We believe that the current study and further epidemiologic studies from other countries will provide additional knowledge and delineate the demographic characteristics of traumatic shoulder dislocations. Consequently, more definitive results might be retrieved by taking more detailed and valid protective measures.

**Conflicts of Interest:** No conflicts declared.

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