Incidence of Posttraumatic Shoulder Dislocation in Poland

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Background: The incidence of shoulder joint dislocation has been estimated at 11–26 per 100 000 population per year. In our opinion, basic epidemiological data need to be continually updated in studies of large populations. To study the incidence of posttraumatic dislocation of the shoulder joint in the Polish population.

Material/Methods: We retrospectively investigated the entire Polish population between 1 January 2010 and 1 January 2015. To identify the study group, data collected in the electronic database of the National Health Fund were used. The study group was divided into subgroups to detect possible differences in the incidence of shoulder dislocation with regard to age, sex, and season of the year (month) when the dislocation occurred.

Results: The cumulative size of the study sample was 192.72 million over the 5 years of the study. We identified 51 409 patients with first posttraumatic shoulder dislocation, at a mean age of 50.83 years (SD 21.12), from 0 to 104 years. The incidence of traumatic shoulder dislocations for the entire study group ranged from 24.75/100 000/year (number of posttraumatic shoulder dislocations per 100 000 persons per year) to 29.09/100 000/year, for a mean of 26.69/100 000/year.

Conclusions: In this study, the overall incidence of first-time posttraumatic shoulder dislocations in the Polish general population was 26.69 per 100 000 persons per year. These results are higher than estimates presented by other authors. It is necessary to study, regularly update, and monitor this problem in the general population.

MeSH Keywords: Incidence • Shoulder Dislocation • Shoulder Joint

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Background

The shoulder joint is the most commonly dislocated joint in the human osteoarticular system [1–3]. This propensity for dislocation is associated with the exceptional structural and biomechanical features of the joint, which enable a wide range of motion and manipulative ability, but at the same make the shoulder joint prone to being dislocated [1,4,5]. The incidence of shoulder dislocations has been estimated at 11.2–26.2 per 100,000 population per year [6,7]. The available data thus reflect a significant discrepancy of such estimates. Still, few studies have been concerned with the incidence of shoulder joint dislocations in large populations. Some papers have targeted homogeneous groups, such as rugby players or military personnel [8–10]. In our opinion, basic epidemiological data need to be continually updated in studies of large populations. We also believe that deriving estimates of incidence from studies of homogeneous groups at high risk for dislocation may not reflect the actual magnitude of the problem. These assumptions prompted us to investigate the incidence of traumatic shoulder dislocation in the entire population of Poland. To our knowledge, no incidence studies of traumatic shoulder dislocation based on data from a group of this size have ever been published. Data from such a large sample may represent a significant contribution to the determination of basic epidemiological parameters concerned with dislocations of the shoulder joint.

Purpose

To study the incidence of traumatic dislocation of the shoulder joint in the Polish population.

Material and Methods

This is a retrospective study. The study design and the final report were submitted for review to an ethics committee, which fully acknowledged the compliance of the study with ethical principles and the applicable law. The study involved the entire Polish population between 1 January 2010 and 1 January 2015. The basic demographic indices of the population (overall size and size by age, sex, and age groups) in the study period were obtained from the publicly available database of the Central Statistical Office of Poland (GUS) [11], an official online government portal containing data on the population and distribution by sex and age. The incidence of shoulder dislocation with regard to age (10-year age spans), sex, and season of the year (month). On the basis of our data, the count and frequency of traumatic shoulder dislocations in the study period were determined for the entire Polish population. Further analyses were conducted using basic demographic indices as described above. Incidence rates (the number of new dislocation events per 100,000 population registered in 1 year) were then calculated for each year of study and a mean value was calculated to obtain incidence figures for the entire period of study. Histograms of patient age at first dislocation showed that, despite the large sample sizes, the distributions were considerably different from the normal distribution. Accordingly, the non-parametric Mann-Whitney U test was used to confirm sex-related differences. For the same reason, medians are provided alongside mean values. The non-parametric Kruskal-Wallis test was used to detect any differences in incidence within the study’s time frame. The confidence level was set at p<0.05.

Inclusion criteria: patients with a diagnosis of shoulder dislocation made by a hospital emergency department physician that was coded and recorded in the database of the National Health Fund according to the International Statistical Classification of Diseases and Related Health Problems (ICD 10) – S 43.0 (Version applied in Poland during the study period) [12,13], only 1 dislocation event during the study period was included (any subsequent dislocation events in the same patient were treated as recurrences that might confound the results), patients with diagnosed all concomitant injuries including fractures, only Polish citizens permanently residing in Poland were enrolled. Exclusion criteria: no diagnosis or appropriate (ICD10-compliant) coding of shoulder dislocation, all “duplicating” shoulder dislocation events in the same patient were regarded as recurrences, patients who were not residents of Poland were excluded from the study. In order to identify the group of patients with first-time traumatic shoulder joint dislocations suffered in Poland in the individual years of the study period, we used de-individualized data collected in the electronic database of the National Health Fund in keeping with the applicable legal provisions regarding the protection of personal data in Poland. Records were extracted if they contained a diagnosis of shoulder dislocation made at a hospital emergency department and coded in an ICD 10-compliant manner. Each patient was assigned a unique technical identifier representing a combination of digits that precluded any possibility of personal identification of the patient. Each technical identifier could appear only once in the dataset in the study period. All repeat visits to hospital emergency departments with a diagnosis of shoulder dislocations were rejected. The resulting group comprised patients who presented at a hospital emergency department on account of a shoulder dislocation only once over the 4 years of the study. This allowed for excluding multiple-visit patients (i.e., those with recurrent shoulder dislocation). Patients with known shoulder joint instability were also excluded on the basis of an earlier ICD 10 diagnosis. Thus, we ultimately obtained a group of patients diagnosed with their first-ever traumatic shoulder dislocation. The basic demographic parameters were used to present differences in the incidence of shoulder dislocation with regard to age (10-year age spans), sex, and season of the year (month). On the basis of our data, the count and frequency of traumatic shoulder dislocations in the study period were determined for the entire Polish population. Further analyses were conducted using basic demographic indices as described above. Incidence rates (the number of new dislocation events per 100,000 population registered in 1 year) were then calculated for each year of study and a mean value was calculated to obtain incidence figures for the entire period of study. Histograms of patient age at first dislocation showed that, despite the large sample sizes, the distributions were considerably different from the normal distribution. Accordingly, the non-parametric Mann-Whitney U test was used to confirm sex-related differences. For the same reason, medians are provided alongside mean values. The non-parametric Kruskal-Wallis test was used to detect any differences in incidence within the study’s time frame. The confidence level was set at p<0.05.
Results

According to Central Statistical Office of Poland data, the Polish population in the study period (December 31, 2009 – January 1, 2015) numbered from 38 478 602 individuals in 2014 to 38 538 447 in 2011, for a mean count of 38 538 447 individuals. The analysis was concerned with basic demographic data (population size and sex- and age-based distribution of the population). No significant differences or trends of change in the size of the Polish population were identified with regard to these parameters for the consecutive years of study. Consequently, our study group was analyzed as a 5-year cumulative sample of 192.72 million individuals. The detailed demographic data for the Polish population, including distribution of the population size according to gender and the designated age spans, are presented in Figures 1 and 2.

and the entire population in the consecutive years of study for the designated age groups (Table 1). The age of the patients at their first-time shoulder dislocation ranged from 0 to 104 years in the entire population, for a mean age of 50.83 years (SD 21.12). For females, the age range was 0–104 years (SD 20.75), and for males it was 0–99 years (SD 18.89). The mean age at first traumatic shoulder dislocation in males was significantly lower (p=0.00) than in females. Analysis of dislocation count per gender and age group (Figure 3) showed the highest dislocation counts among 60–69-year-olds in women and among 20–29-year-olds in men. With regard to the entire population, the highest count of first-time traumatic shoulder dislocations was noted in the 60–69 age group (Figure 3). Annual incidence figures for the entire group of 51 509 patients ranged from 24.75/100 000/year to 29.09/100 000/year, for a mean of 26.69/100 000/year (SD 1.66). For women, the annual figures ranged from 17.5/100 000/year to 20.9/100 000/year, for a mean of 18.7/100 000/year (SD 1.33), and for men the range was from 32.5/100 000/year to 37.8/100 000/year, for a mean of 35.2/100 000/year (SD 2.1). Analysis of the incidence of shoulder joint dislocation per gender and age group (Figure 4)
showed the highest incidence rate among women older than 80 years, and among 60–69-year-olds in men. With regard to the entire population, the highest incidence rate of traumatic shoulder dislocations was noted in the 80 years and older age group (Figure 4). The detailed data on incidence for the entire study period can be found in Table 2. There were no significant differences in incidence between individual years of study with regard to the entire group (p=0.91) as well as with regard to the female (p=0.63) and male (p=0.96) subgroups.

Analysis of incidence of traumatic shoulder dislocations per season of the year revealed a statistically significant correlation between month and season of the year and the count of shoulder dislocations (r=0.47, p=0.00005), with dislocations occurring most commonly in winter (13.75%), including a peak in January (5.15%), and least often in autumn (12.41%), with a nadir in November (3.79%).
This paper is concerned with incidence figures. Incidence is a very important measure of a population’s health needs because it allows for monitoring changes in the occurrence of a disease over time in all members of the population, making it possible to plot the changes on a timeline and assess the significance of a given medical condition. Certainly, the value of descriptive and analytical data pertaining to incidence increases as the size of the study population grows. To our knowledge, this is the first study of such a large sample, with a cumulative sample size of 192.72 million over the 5 years of study. Our analysis relies on the acquisition of direct data covering an entire population, which is of immense importance with regard to reliability of the findings, rather than extrapolating data from a random sample to the entire population, which might distort

**Table 2.** Incidence in the designated age groups among females, males and the entire population in individual years of study.

| Age groups (years) | 2010 year | 2011 year | 2012 year | 2013 year | 2014 year |
|--------------------|-----------|-----------|-----------|-----------|-----------|
|                    | Female    | Male      | Total     | Female    | Male      | Total     |
| 0–9 yr             | 4.30*     | 3.73      | 4.01      | 4.06      | 3.46      | 3.75      |
| 10–19 yr           | 5.94      | 21.36     | 13.83     | 6.47      | 19.85     | 13.32     |
| 20–29 yr           | 7.61      | 46.66     | 27.45     | 6.87      | 46.53     | 27.03     |
| 30–39 yr           | 7.91      | 35.51     | 21.90     | 6.92      | 34.86     | 21.08     |
| 40–49 yr           | 11.15     | 36.50     | 23.89     | 12.30     | 33.39     | 22.89     |
| 50–59 yr           | 21.24     | 48.87     | 34.63     | 18.20     | 47.06     | 32.21     |
| 60–69 yr           | 39.90     | 59.19     | 48.63     | 33.88     | 55.36     | 43.62     |
| 70–79 yr           | 70.10     | 53.48     | 63.65     | 60.02     | 57.16     | 58.91     |
| ≥80 yr             | 75.03     | 48.44     | 67.09     | 66.17     | 49.22     | 61.07     |
| Total              | 20.93     | 37.77     | 29.09     | 18.77     | 36.74     | 27.47     |

* Incidence rate – the number of primary posttraumatic dislocations per 100,000 population per year.

**Discussion**

This paper is concerned with incidence figures. Incidence is a very important measure of a population’s health needs because it allows for monitoring changes in the occurrence of a disease over time in all members of the population, making it possible to plot the changes on a timeline and assess the significance of a given medical condition. Certainly, the value of descriptive and analytical data pertaining to incidence increases as the size of the study population grows. To our knowledge, this is the first study of such a large sample, with a cumulative sample size of 192.72 million over the 5 years of study. Our analysis relies on the acquisition of direct data covering an entire population, which is of immense importance with regard to reliability of the findings, rather than extrapolating data from a random sample to the entire population, which might distort
the results. All study participants lived on the territory of Poland, which is a country situated in a single time zone and a single climate zone (temperate). The duration of the study, which is another criterion required for an analysis of incidence, was 5 years. The analysis addressed 3 basic questions that characterize a population, namely Who? Where? and When? Our study did not focus on a particular selected group of patients, such as military personnel, as studied by Owens in a study of the population of a military academy showing an incidence rate of 290 dislocations per 100 000 person-years, or collision athletes, studied by Bohu, who reported an incidence of 190/100 000/year [8,9]. We believe that such sample selection cannot

Table 3. Comparison of present study results with available data from literature.

|                      | Simonet et al., 1984 | Krøner et al., 1989 | Nordqvist and Petersson, 1995 | Zacchilli and Owens, 2010 | Liavaag et al., 2011 | Current study |
|----------------------|----------------------|----------------------|-----------------------------|--------------------------|----------------------|---------------|
| Population selection | Olmsted MN (rural)    | Denmark (urban)      | Malmo, Sweden (Urban)       | NEISS Sample (United states population) | Norway Oslo (urban) | Poland, Entire population |
| Group selection      | All traumatic dislocations | None            | First-time traumatic dislocations | Probability sample (model) | All traumatic dislocation | First-time traumatic dislocations |
| Population           | 880,000               | 1,268,765 (million) | 230,056                      | 1.46 billion (model)      | 575,475              | 192.72 (million) |
| Study period (years) | 1970–1979 10 yr       | 1980–1984 5 yr      | 1987 1 yr                    | 2002–2006 5 yr           | 2009                 | 2010–2014 5 yr |
| Mean age (years)     | 36.4 yr               | 51 yr               | Male 44 yr Female 63 yr      | 35.4                      | Median 34            | Male 44.83 Female 61.33 |
| All dislocations (n) | 124                   | 216                  | 55                           | 8940 (349,486 (model))   | 324                  | 51,409 |
| Male population (%)  | 66.7%                 | 53.3%                | 53%                          | 71.8%                     | 72.4%                | 63.85% |
| Female population (%)| 33.3%                 | 46.7%                | 47%                          | 18.2%                     | 27.6%                | 36.15% |
| Incidence rate*, all dislocations | 11.2 | 17 | ✔️ | 23.9 | 56.3 | ✔️ |
| First-time dislocations | 8.2 (all genders) | 12.3 (both genders) | 23.9 | ✔️ | 26.2 | 26.69 (first time) |
| Male incidence rate | 11.2 (all dislocations) | 9.1 | 27 | 34.9 | 82.2 (all dislocations 34.8 (first-time) | 35.2 |
| Female incidence rate | 5.0 (all dislocations) | 8.0 | 22 | 13.3 | 30.9 | 17.9 (first-time) 18.7 (first time) |
| Peak of incidence, all group | 20–29 (13) | NR | >65 | 20–29 (47.8) | >80 (first-time) 20–29 (all dislocations) | ≥80 yr. (61.41) (first time) |
| Peak of incidence, males | 20–29 (23.4) | 21–30 | >65 (43) | 20–29 (79.2) | >80 (first-time) 20–29 (all dislocations) | ≥80 (53.54) |
| Peak of incidence, females | >60 (15.5) | 61–80 | >65 (53) | 80–89 (38.8) | >80 (first-time) >80 (all dislocations) | >80 (68.77) |

* Incidence rate – the number of dislocations per 100 000 person per year.
be representative for an entire population as soldiers and athletes are groups at higher risk of traumatic dislocations of the shoulder joint, which distorts study results and may not be extrapolated to the entire population. Our study adopted no age limits; only age spans were used to better characterize incidence across the study population. This methodology made it possible to investigate the entire spectrum of the study population. Our results differ substantially from data presented by some other authors (Table 3). The mean incidence of first-time traumatic shoulder dislocations in the Polish population was 26.69/100 000/year (SD 1.66). Simonet reported a rate of 11.2/100 000/year for all dislocations, while Koroner reported a figure of 12.3/100 000/year for first-time traumatic dislocations [6,14]. Both these figures are more than 2-fold lower than ours. The most similar estimates can be found in Liavaag [7]. The differences between our data and the results given by Simonet are, in our opinion, due to lifestyle changes since 1970 and the fact that Simonet’s study evaluated only 1 town (Olmsted, Minnesota, USA), making it rather likely that the sample was not representative. Similar factors might explain the differences between our results and Krøner’s [6,14]. The convergence of our data and those reported by Liavaag may be due to the characteristics of the study population and the methodology, because Oslo, the capital of Norway, is a big city with its population showing considerable diversification with regard to the level of physical activity and age. Liavaag’s study was also a direct investigation that used no extrapolation of results and the data were obtained in 2009, which fits well with the study period in our investigation. Moreover, the population of Oslo accounts for approximately 10% of the entire population of Norway, which was slightly above 5 million in 2009 [7]. Accordingly, the sample used in the Oslo study appears to be more representative than the data presented by Simonet for the USA, which had a population of over 200 million in the 1970s. These methodological considerations associated with the characteristics of the respective study populations (population size) and representativeness of the sample underlie, we believe, the differences and similarities between the results of those studies and ours [6,7]. In our study, peak incidence was noted between the ages of 60 and 69 years among males and after the age of 80 among females, which was again considerably different from the data reported by Simonet [6], Krøner [14], and Zacchilli [15]. Differences were particularly evident with regard to males, and the other authors reported peak incidence for males in the 3rd decade of life. At the same time, Nordqvist [16] and Liavaag [7] report similar periods for peak incidence of traumatic shoulder dislocation, which is due to the fact that they were concerned with first-ever dislocation events. Analysis of incidence figures in particular months of the year shows a significantly higher incidence in the winter months, with a peak in January, when it is winter in the Northern Hemisphere and the risk of slipping or stumbling over something and falling incidents leading to shoulder injuries, including dislocations, is higher. This is especially true of less physically able individuals possessing poorer co-ordination skills, which, in our opinion, explains these statistically significant differences. The results of our study, and, in particular, the differences between our results and literature data, confirm the importance of continuous investigation of incidence of shoulder dislocations. The discrepancies between our data and literature reports resulted in a discussion. We still see the need to analyze basic indices of population health. At the same time, we see limitations in using such a large sample, and primarily the inability to study in detail a larger set of variables, such as activity level, type of occupation, and type of sport practised. Hence, we see room in subsequent publications for analyzing the causes and describing basic indices of shoulder dislocation recurrences on the basis of direct data, as in this paper, and also by extrapolating detailed data from a representative sample onto an entire population.

**Conclusions**

In this study the overall incidence of first-time traumatic shoulder dislocations in the Polish general population was 26.69 per 100 000 persons per year. This result indicates a higher incidence rate than the findings of other authors, but our sample was larger than those in other papers and is more representative. It is necessary to study changes in the incidence of shoulder joint dislocation over time with regular updates and to monitor this problem in the general population to make our understanding more accurate.

**Conflicts of interest**

No conflicts of interest.

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