

The epidemiology of hand injuries in the Netherlands and Denmark

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Abstract. Little is known about the magnitude of hand injuries at national levels. This paper quantifies and characterises the incidence of hand injuries that require acute medical attention at Emergency Departments in the Netherlands and Denmark. Except for the incidence rate and the referral after treatment, the overall picture of hand injuries is similar for both countries: hand injuries show a peak for teenagers, result mainly from home and leisure accidents, are mainly caused by objects and falls, the majority affect

fingers and result mainly in superficial injuries, open wounds and fractures, a small proportion of the victims is admitted into hospital. We conclude that hand injuries are a real burden to society and are worthwhile to be prevented with special attention for home and leisure accidents and occupational accidents. Data recording on the backgrounds of accidents and their long term consequences should be improved.

Key words: Accident prevention, Emergency departments, Hand injuries

Introduction

In highly specialised societies many daily activities require handy skills. Thus, hand injuries will cause major problems for individuals in all ages. From a public health point of view, hand injuries that require acute medical attention deserve special attention, since the injuries place large burden on the health-care and social system. However, the current epidemiological information on hand injuries coming to acute medical care in the general population is sparse. Most studies are limited to one or two Emergency Departments (EDs) or describe just a selection of hand injuries related to a specific activity or age group. In order to establish targeted strategies for the prevention of hand injuries, more information on the occurrence and characteristics of hand injuries is required.

Based on data of the Dutch Injury Surveillance System (LIS) and the Danish Accident Register (DAR), we determined the age and sex-specific incidence rates of hand injuries treated at the ED in the Netherlands and Denmark. We compared the results of both countries and discuss noted differences. Furthermore, we studied the characteristics of these injuries regarding the accident, resulting injury type, and consequences.

Materials and methods

Data sources

The analysis is based on hand injuries that were recorded in LIS and DAR in 1997 and 1998. LIS is a surveillance system that was launched in 1984 and collects data on all injuries (and in most hospitals on all ED attendances) reported at the ED of 17 hospitals [1]. The hospitals participating in LIS represent a representative sample of about 10% of the total number of hospitals in the Netherlands (total population of 15.7 million) [1]. That means that from LIS national extrapolations can be calculated. Every year about 125,000 unintentional injuries are being recorded by LIS. LIS has proven to be the main source for accident prevention policy for two decades and the LIS data has a high quality as was concluded from a research into the quality and validity of the data [2].

In Denmark the European Home and Leisure Accident Surveillance System (EHLASS) is developed for the purpose of monitoring causes of accidents in the home and during time of leisure, the consequences of the accidents and the consumer products involved in the accidents. EDs of five hospitals are participating in EHLASS in Denmark since

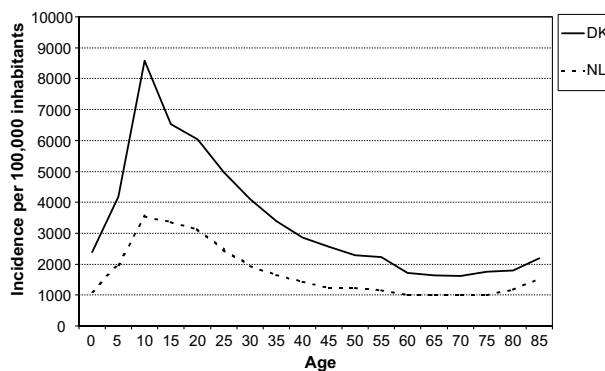


Figure 1. Incidence of hand injuries per 100,000 inhabitants for the Netherlands and Denmark.

1986. They cover a catchment area of approximately 14% of the Danish population (total population of 5.3 million). Since January 1, 1990, all ED contacts due to other accidents than home and leisure accidents have been recorded at the same five hospitals. Data comprising all accident categories are collected in DAR.

Calculation of rates

A hand injury was being defined as an injury to the hand including wrist injuries. The analysis is based on 57,428 records concerning hand injuries due to unintentional injuries for the Netherlands and 55,231 for Denmark in 1997 and 1998. The data collection procedure for LIS and DAR are similar. The paper gives the extrapolated numbers per year (the average of 1997 and 1998). Although both surveillance systems record similar data elements, some adjustments had to be made to be able to compare the data between the two countries. The rates were age standardised, using direct standardisation with the population in Denmark on January 1, 1998 as the standard.

Results

Incidence

The annual number of unintentional injuries treated at an ED in the Netherlands is 1 million (i.e. 6300 injuries per 100,000 inhabitants) and 662,000 for Denmark (i.e. 12,500 per 100,000 inhabitants). Hand injuries constitute for both countries 29% of all unintentional injuries: 287,000 for the Netherlands (i.e. 1800 per 100,000 inhabitants) and 191,000 for Denmark (i.e. 3600 per 100,000 inhabitants).

The majority of the victims of a hand injury are male (62% for the Netherlands and 59% for Denmark). The sex distribution for all unintentional injuries shows a similar distribution, i.e. 59% male victims in both countries.

Figure 1 shows a peak in the number of hand injuries for 10–14 year olds. Below 10 years of age about as many girls as boys are injured, while for 10–64 years the majority of the victims is male. The victims older than 65 years of age are more often females than men. This applies for the Netherlands as well as Denmark.

Accident characteristics

Table 1 shows that the majority of the hand injuries is caused by a home and leisure accident. However, the table also shows that a relatively high proportion of hand injuries are caused by an occupational accident. In Denmark the proportion of hand injuries caused by an occupational accident is higher than in the Netherlands, while the proportion due to a transport accident is rather low.

Most victims (53% for the Netherlands and 66% for Denmark) injured their hand because they contacted an object (mainly a moving or a cutting/stabbing/piercing object), while 33% for the Netherlands and 27% for Denmark was injured because they fell. Compared to all unintentional injuries, a lot of events were due to contact with an object: 46% for the Netherlands and 44% for Denmark for all unintentional injuries. About one third of the hand injuries in both countries is due to a fall, which is low compared

Table 1. Percentages of hand injuries and all unintentional injuries for the Netherlands and Denmark by accident category

| | Hand injuries | | All injuries | |
|--|---------------|-----|--------------|-----|
| | Nl | Dk | Nl | Dk |
| Home and leisure accident (excl. sports accidents) | 59 | 57 | 56 | 58 |
| Occupational accident | 18 | 23 | 11 | 16 |
| Sports injury | 15 | 15 | 18 | 16 |
| Transport accident | 7 | 5 | 14 | 10 |
| Total | 100 | 100 | 100 | 100 |

to all unintentional injuries due to a fall (46% for the Netherlands and 41% for Denmark).

Although the actual activity during which the victim was injured is unknown for half of the Dutch patients, it is remarkable that 9% is injured during do-it-yourself activities. If the victim's hand was injured during sports activities, it was usually during outdoor soccer playing: 22% for both countries. In Denmark a lot of all hand injuries due to sports result from handball (21%).

Type of injury

Over half of the events were finger injuries (52% for the Netherlands, 57% for Denmark). The rest of the injuries is equally distributed over wrist injuries and injuries to the hand excluding fingers.

The hand injuries recorded are in both countries often open wounds and fractures if we compare hand injuries to all unintentional injuries (Table 2).

The top-5 of hand injuries for both countries (Table 3) constitute about two thirds (69% for the Netherlands and 66% for Denmark) of all hand injuries.

Table 2. Percentages of hand injuries and all unintentional injuries for the Netherlands and Denmark by type of injury

| | Hand injuries | | All injuries | |
|----------------------|---------------|-----|--------------|-----|
| | Nl | Dk | Nl | Dk |
| Superficial injuries | 34 | 25 | 34 | 37 |
| Fractures | 28 | 22 | 22 | 12 |
| Open wounds | 26 | 34 | 18 | 18 |
| Sprains | 4 | 11 | 10 | 19 |
| Other | 8 | 8 | 16 | 13 |
| Total | 100 | 100 | 100 | 100 |

Table 3. Top-5 of hand injuries for the Netherlands and Denmark; percentages and incidence rates

| | % | Rate per 100,000 inh. |
|--|----|-----------------------|
| <i>The Netherlands</i> | | |
| 1. Superficial injury to fingers | 18 | 330 |
| 2. Open wound fingers | 18 | 320 |
| 3. Wrist fracture | 14 | 260 |
| 4. Superficial injury hand excl. fingers | 10 | 180 |
| 5. Finger fracture | 9 | 160 |
| <i>Denmark</i> | | |
| 1. Open wound fingers | 25 | 900 |
| 2. Superficial injury to fingers | 14 | 510 |
| 3. Wrist fracture | 12 | 440 |
| 4. Open wound hand excl. fingers | 8 | 270 |
| 5. Finger fracture | 7 | 250 |

Children of 5–14 years of age have a higher incidence of wrist injuries than other age groups for the Netherlands and Denmark. Home and leisure accidents and sports injuries lead relatively often to a wrist injury, while transport injuries often result in hand injuries excluding fingers. Occupational injuries lead to a relatively lot of finger injuries. The part of the hand that was injured differs per type of sports, but soccer was the main sports for most parts of the hand for both countries: 25% for the hand excluding fingers, 24–25% for the wrist, and 19–20% for the fingers. In Denmark only handball results in more finger injuries than soccer (29%).

In the Netherlands 35% of the victims do not receive additional treatment and 41% is referred to the outpatients clinic, while these percentages are 58 and 14 respectively for Denmark (Table 4).

To get some idea about the severity of the injuries, the data include two proxies which are comparable for both countries: the percentage of fractures and the percentage for referral after treatment at the ED, especially admitted to hospital. The proportion of hand fractures is higher for the Netherlands than for Denmark (Table 2: 28 and 22% respectively). Compared to the proportion of fractures for all unintentional injuries (22% in the Netherlands and 15% in Denmark), the proportion of hand fractures is rather high in both countries. That means that based on fractures as being a proxy, hand injuries are rather severe injuries.

However, if we look at the percentage of hospital admissions (Table 4), hand injuries turn out not to be very severe. The proportion of further treatment at the outpatients clinic is high for the Netherlands if compared to all unintentional injuries.

Discussion

Hand injuries are a real burden to society. One out of every 55 Dutch inhabitants and one out of every 28 Danes annually visit the ED to be treated for such an injury. That means that over a quarter of all unintentional injuries are hand injuries. If we look at hand injuries in both countries for the past decade, it turns out that the number treated at an ED is rather stable.

Previous studies show that the proportion of hand injuries out of all unintentional injuries treated at EDs varies from 14 up to 27% [3–8]. Based on hospital registrations in the northern part of Europe the annual incidence rate of hand injuries treated at the ED has been estimated to 1500–3800 per 100,000 inhabitants [4, 5, 9–11]. The results from our study fit within these ranges. Some of the noted differences may be due to differences into the accessibility of the ED for injury victims or to different definitions of 'hand injury'.

Table 4. Percentages of hand injuries and all unintentional injuries for the Netherlands and Denmark by referral after treatment at the ED

| | Hand injuries | | All injuries | |
|----------------------|---------------|-----|--------------|-----|
| | Nl | Dk | Nl | Dk |
| No further treatment | 35 | 58 | 38 | 66 |
| To GP | 21 | 25 | 22 | 18 |
| To outpatient clinic | 41 | 14 | 32 | 10 |
| Admitted | 2 | 3 | 7 | 6 |
| Other/unknown | 1 | 1 | 2 | 1 |
| Total | 100 | 100 | 100 | 100 |

About 60% of the victims are male, while especially teenagers have injured their hands. This information is often not presented in the available literature, but the results is similar to the ones found in Odense in 1983 [4]. The peak for teenagers probably has to do with large exposure, in particular to sports.

Most hand injuries are caused by home and leisure accidents, but a remarkably large part is due to occupational accidents. This result is similar to what Angermann and Lohmann [9] found in their study in five Danish EDs and Nieminen et al. [5] in Finland: 69 and 70% home and leisure accidents (including sports) and 26 and 28% occupational accidents respectively. The main accident mechanism for hand injuries are cutting, stabbing or piercing objects and falls. Most hand injuries during sports occur during soccer, which is likely to be explained by the high number of soccer players in both countries. This is underlined by the fact that the second sports in Denmark is handball which is also number two on the list of sports leading to hand injuries.

The most occurring hand injury is an injury to one or more fingers. The three most occurring injury types are similar in both countries, namely open wounds and superficial injury to fingers and wrist fractures. Those three types of injuries are responsible for about half of the hand injuries.

Denmark has a high proportion of occupational accidents and therefore, compared to the Netherlands, a lot of finger injuries.

Only a small percentage (2–3%) of the victims with a hand injury needs to be admitted after being treated at the ED: 36 per 100,000 inhabitants for the Netherlands and 91 for Denmark. Literature shows percentages between 2 and 5% [7–9, 12]. Hospital discharge statistics (100% coverage) in both countries show that the annual number of hospital admissions due to a hand injuries is at least 40 per 100,000 inhabitants in the Netherlands (i.e. 6300 in total) [13] and 96 per 100,000 for Denmark (i.e. 5100 in total) (Danish National Discharge Register 1997–1998). These figures only include hand injuries as a primary diagnosis, while also intentional injuries are included. The figures demonstrate that the data from the surveillance systems we have analysed are reli-

able because the incidence rates for hospital admission are similar for both data sources for both countries.

If we consider the proportion of fractures, the proportion of hospital admission, and the direct medical costs of injuries as a proxy for the severity of the injury, hand injuries seem to be less severe than all unintentional injuries. However, it should be considered that, unlike most other injuries, even rather severe hand injuries can be treated at an outpatients clinic.

The overall picture of hand injuries are similar for both countries included, but there are some remarkable differences. The most striking difference is the number of hand injuries treated at an ED per 100,000 inhabitants: That is twice as high for Denmark. This difference can be explained in three ways: either the incidence rate of hand injuries is actually higher in Denmark, or the registration in the Netherlands is worse, or the behaviour of visiting the ED with a (hand) injury differs, for instance because the threshold to visit an ED in the Netherlands is higher than in Denmark. We have no reason to believe that the incidence rate of (hand) injuries in those countries differs so much, taking into account the rather similar culture and therefore similar exposure to accidents. The quality of LIS is regularly checked and we have therefore no reason to believe that the quality of the surveillance system is the reason for the noted difference. The most obvious explanation is the access to the ED. This would mean that the hand injuries treated at an ED in the Netherlands should be more severe than in Denmark. Some of the available indicators for severity (proportion of fractures and referrals to an outpatient clinic) underline this explanation. In the Netherlands the proportion of victims that are referred to the outpatients clinic is much higher than in Denmark. However, the proportion of hospital admissions due to a hand injury is similar in both countries (2–3%), which means a very different incidence rate: 36 per 100,000 inhabitants in the Netherlands and 91 in Denmark. This difference is somewhat smaller for all unintentional injuries, but still remarkable: 470 Dutch people per 100,000 inhabitants are admitted to hospital and 690 in

Denmark. This means that the number of Danes admitted for an unintentional injury is already higher, but for hand injuries this difference is even larger. This is remarkable since one would expect, taking into account the expectation that the way of treating injuries is similar in both countries, that at least the number of hospital admissions would be similar. A logical reason for the conclusion that more severe patients attend the ED in the Netherlands might be that more patients, especially those with minor injuries, will go to a General Practitioner. The General Practitioner has a central role in the Dutch health care system as being the 'gatekeeper' to the health care facilities. This explanation is supported by the fact that admitted people with a hand injury stayed on average 5.5 days in hospital in the Netherlands, but only 2.7 days in Denmark. This difference is also noted for all unintentional injuries: Average stay of 10.0 days in the Netherlands and 6.2 days in Denmark, which suggests a large influence of the health care system. It is concluded that hand injuries treated at an ED in the Netherlands are more severe than in Denmark and that this difference is the most important explanation for the difference in the overall incidence rates of hand injuries for both countries.

The results show that hand injuries are not the most severe injuries, but the number of hand injuries is pretty high. Based on LIS it is possible to calculate the direct medical costs^a of hand injuries treated at the ED in the Netherlands [14, 15]. The total medical costs for hand injuries is 122,000 Euro in 1997, i.e. 420 Euro per patient. The average direct medical costs of an unintentional injury is 870 Euro. Hand injuries constitute 14% of the total costs of unintentional injuries. Further the costs in the social system due to sickness benefits might be considerable, especially since young patients are involved. This burden to society indicates that it is worthwhile to try to prevent hand injuries. The current available information is insufficient for efficient and effective prevention: more research is needed into the circumstances of the accidents. However the analysis already gave some guidance to prioritise the prevention of hand injuries. Extra attention should be paid to occupational accidents and do-it-yourself activities. Also the prevention of falls and/or its consequences are specific issues in preventing hand injuries.

It would be helpful to include some information relevant for accident prevention in trauma registries: preferably in a standardised way, for instance by using the International Classification of External Causes of Injuries [16].

More information is needed on the consequences of hand injuries and its treatment, especially on the

post-injury level of functioning. This is relevant for priority setting in accident and injury prevention, but also for quality assessment of the treatment of hand injuries.

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^a Direct medical costs included in this study are the costs for treatment by a General Practitioner, the costs of ambulance transport, hospital care, rehabilitation, nursing home care, physiotherapy, and home care.