

Long-term health effects of unintentional injuries in Danish adults

Bjarne Laursen & Hanne Møller

ABSTRACT

INTRODUCTION: The objective of the present study was to determine the prevalence of self-reported health effects of unintentional injuries in the adult Danish population, including the limitation of daily activities and perceived general health.

MATERIAL AND METHODS: In the 2005 National Health and Morbidity Survey in Denmark, 14,566 adults aged 16 years or more were asked about long-term health effects of unintentional injuries. Those reporting long-term health effects were asked about the type and duration of these effects and the accompanying limitation of their daily activities. Information on the external causes of injury was obtained by linking the interview data to the National Patient Register.

RESULTS: In total, 1,058 respondents (7.3%) reported health effects of injuries. Among these, 336 (2.3%) reported considerable limitations in their daily activities. Those reporting health effects also reported poor health in general. The most severe health effects affected the head, neck and back, as well as multiple body parts. Those injuries that entailed the most severe health effects were caused by traffic injuries and falls.

CONCLUSION: Long-term effects of injuries are prevalent in the adult population and most can be attributed to falls and traffic injuries. Back injuries and multiple injuries had the largest influence on perceived health.

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TRIAL REGISTRATION: not relevant.

Injuries are the most frequent reason for hospital contact in Denmark, and every year nearly 600,000 persons corresponding to 11% of the total population are treated at a hospital [1]. Although most injuries are not severe, some have long-term health effects, and in rare cases the health effects are permanent. In a study of injury data from hospital discharge registers in six European countries including Denmark, Polinder et al found that injuries carry a high disability burden [2].

It is known that severe brain injuries and back injuries may have severe effects on physical as well as mental health [3, 4]. Even mild brain injuries (concussion) may have lasting effects [5]. Studies of patients with major trauma (injury severity score > 15) have

shown disability up to five years after injury [6-8]. Less is known about the effect of less severe injuries, which may contribute to the disability burden of injuries due to their large number. Although Polinder et al [9] found that non-hospitalized patients had recovered after five months, there may be groups of patients with less severe injuries who have disabilities that last more than a few months. Toft et al [10] found an increased level of self-reported health problems for a variety of injuries, some of which lasted more than five years, including patients with injuries treated as outpatients.

In the 2005 Danish National Health Survey conducted by the National Institute of Public Health, a representative sample of adults was asked about the long-term effects of illness and injuries [11]. They were also asked whether these effects were related to unintentional injuries.

The aims of the present study were to determine the prevalence of self-reported health effects of unintentional injuries in the adult Danish population, including any limitation of daily activities and perceived general health.

MATERIAL AND METHODS

The study is based on interview responses from the National Health Interview Survey in 2005 [11]. A representative sample of 21,832 Danish citizens aged 16 years and above was invited to answer a number of questions on health and health behaviour. The survey included questions on long-term effects of illness and injuries. The questions were: Do you have any long-standing disease, disorder or illness, long-standing effects of injury, any functional impairment or any other long-standing health problem (six months or more)? (yes/no); which disease, disorder or illness do you have? (description); where in your body is it located (description); how many years have you had this disease, disorder or illness (number); does the disease, disorder or illness limit you in your work or daily activities? (much/somewhat/no); did an unintentional injury cause the disease, disorder or illness? (yes/no). Each person could report up to four different health effects.

Based on the above mentioned answers, the injured group was defined: Those reporting effects related to unintentional injuries were included, except those who

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University of Southern Denmark

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described an illness that was very unlikely to result from an injury, e.g. allergy. In addition, those who described a clearly injury-related effect, e.g. "traffic injury" or "leg fracture" were included.

If several injury events were reported, the first mentioned was used for the analysis, assuming that it was the most severe. The effects of the injuries were classified by affected body regions based on the respondents' descriptions. Brain damage causing palsy was classified as "whole body".

All of the interviewed persons answered questions on specific health problems experienced within the past 14 days. For each of the injury groups categorized by affected body region, the prevalence of the health problems was compared with a reference group randomly selected among the interviewed without self-reported injury, and matched by age, sex and educational level.

Further, information on past hospital treatments was obtained by record linkage to the National Patient Register in cases reporting injuries up to six years prior to the interview. Data on all inpatient and outpatient treatments from the 1995-2005-period were collected; the linkage was performed as part of the Danish National Cohort Study [12]. We matched hospital registrations with the self-reported injuries using an algorithm based on match of hospital diagnosis/self-reported body region and time difference and any information about the external cause such as "traffic injury". Only matches with a high level of certainty were used (match of body region or external cause and a maximum two-year difference between the self-reported occurrence of the injury and the hospital-recorded time, or neighbouring body region and a maximum of one year's difference). If several matches were found, the earliest hospital record was chosen. For the persons with a match, infor-

mation on the external cause of the injury was obtained from the hospital registrations.

The prevalence differences were tested using χ^2 test or Fisher's test when there were only two response categories.

Trial registration: not relevant.

RESULTS

In total, 14,566 of the 21,832 invited adults (16 years and above) were interviewed (response rate 66.7%). Non-response due to disability was 0.5%, illness 2% and hospital admission 0.6%.

Among the interviewed, 1,058 (7.3%) reported late effects of injury. Of these, 767 (73% of 1,058) reported that they were limited in their daily activities, and 336 (32% of 1,058) reported experiencing much limitation. **Table 1** shows the proportion of respondents who reported long-term effects of injuries in the various age groups.

Among the 1,058 persons reporting effects of injuries, 589 were men (8.3% of the interviewed men) and 469 were women (6.3% of the interviewed women). In total, 336 persons reported much limitation, 164 men (2.3%) and 172 women (2.3%).

Table 2 presents the distribution of the reported effects by body part and their limitation with regard to daily activities. Whole-body injuries were primarily described as palsy of the body. The vast majority of neck injuries were described as whiplash injuries.

Table 3 shows that those reporting health effects of injury experienced a poorer general health than the reference group. Only one third of those with multiple injuries reported a good self-rated general health, and only half of those with neck and back injuries reported a good self-rated health. In the category "Other or multiple injuries", 67% reported that they were neither working nor under education, compared with the 29% recorded in the reference group. The proportion of early retirees reached 18% among those reporting health effects of injury compared with 5% in the reference group.

A total of 496 respondents reported effects of injuries occurring up to six years before the interview. For 360 of these (73%), hospital records related to injury treatment were identified. For the remaining respondents, we could ascertain either no hospital treatment near the reported time of the injury or hospital contacts that could not be clearly related to the reported injury. Among the 360 hospital contacts, 140 were admissions, 154 were emergency contacts that were not immediately followed by hospitalization, and 66 were other outpatient treatments without other prior hospital treatment.



Unintentional injuries affecting the back often result in long-term health effects.

The hospital contact was classified as unintentional injury in 251 cases, violence in four cases, late complications in 12 cases, and disease and other or unknown in 93 cases. Among the latter, 66 were ambulatory visits for which the external cause of injury is not recorded. Half of the self-reported late effect of injuries during the past six years could thus be related to unintentional injuries treated at Danish hospitals. Among the 251 unintentional injuries, 60 were due to road traffic injuries (24%), including 32 traffic injuries in a car or van. Eight were bicycle injuries, nine were injuries occurring while driving a moped, five were injuries occurring while driving a motorcycle or scooter, and four of the injured were pedestrians. A total of 37 (15%) of the 251 cases were work-related and 50 (20%) were sports injuries. Among the remaining injuries, 67 (64% of the 104 remaining) were due to falls. Road traffic injuries were the most severe, as 53% among those reporting health effects resulting from such injuries stated that they were much limited in their daily activities. Among all injury types, sports injuries had the least effect as only 6% claimed to be much limited and 44% were not limited at all. Among those reporting effects of work-related injuries 27% were much limited in their daily activities.

DISCUSSION

A total of 7.3% of the respondents reported long-term effects related to unintentional injuries, and 2.3% were much limited in their daily activities. The prevalence of injury-related health effects was somewhat higher than found in the US National Health Interview Survey 1994 which reported that 3.3% of the non-institutionalised adult population experienced injury-related disability due to either functional or sensory limitations [13]. A British cohort study showed that, at the age of 23 years, 2.8% reported permanent injury-related disability (onset 16-23 years) [14]. Taking the restricted definition of this study into account, these results are comparable to those of the present study (1.5-4.8% in the 20-29-year age group, depending on the level of disability). Estimates of injury-related disability prevalence based on hospital patient populations are considerably lower, e.g. approximately 0.5% based on data from a Dutch study including only severely injured patients [15].

Respondents who reported health effects of injury had a poorer self-reported health than respondents without injuries. This applied particularly to those with health effects in the neck and back and to people with effects in multiple body parts or the whole body. Health effects in the arms and legs affected the general health only slightly. Hip fractures, however, often resulted in functional limitations; Wehren & Magaziner found that less than 50% recovered fully [16].

In the present study, the injuries resulting in long-

term effects were caused by a wide range of events, the most frequent being falls, road traffic injuries and injuries occurring during sports activities. Among these, traffic injuries, in particular in pedestrians and cyclists, had the most severe long-term health effects.

Approximately half of the self-reported health effects of injury could be identified with a hospital-treated unintentional injury. This corresponds to the proportion of injuries receiving hospital treatment in Denmark [17]. Other injuries may be treated by a general practitioner, on-call doctor, at sports medicine clinics, physical therapists, or in other places which do not routinely report

 TABLE 1

Functional limitation of daily activities for persons reporting long-term effects of injuries. Percentage of the total number of interviewed in each age-group.

Age at interview, years	Much limited, %	Somewhat limited, %	Not limited, %	% reporting effects	Number reporting effects	Number interviewed
16-19	0.7	2.7	2.4	5.8	39	667
20-29	1.5	3.3	3.8	8.6	151	1,766
30-39	2.4	3.0	2.8	8.1	199	2,462
40-49	2.6	3.2	1.8	7.6	205	2,711
50-59	2.8	3.3	2.0	8.1	222	2,724
60-69	2.1	2.6	0.9	5.6	125	2,230
70-	2.7	2.4	0.7	5.8	117	2,006
Total	2.3	3.0	2.0	7.3	1,058	14,566

 TABLE 2

The injury effects by body part, and the degree of limitation of daily activities.

Body part	Limited in daily activities, n			total	%
	much	somewhat	not limited		
Brain, skull ^a	23	10	7	40	3.8
Ear ^a	5	6	8	19	1.8
Eye ^a	4	3	8	15	1.4
Head, other ^a	3	1	1	5	0.5
Neck ^b	48	36	25	109	10.3
Thorax, abdomen ^f	3	3	1	7	0.7
Back ^c	96	104	42	242	22.9
Internal organs ^f	0	1	3	4	0.4
Pelvis ^c	3	2	3	8	0.8
Shoulder ^e	18	34	26	78	7.4
Arm, elbow, wrist ^e	15	34	13	62	5.9
Hand, finger ^e	3	18	17	38	3.6
Hip, thigh ^e	20	16	6	42	4.0
Knee ^d	26	90	81	197	18.6
Lower leg ^e	19	28	19	66	6.2
Ankle ^e	8	16	14	38	3.6
Foot, toes ^e	8	17	13	38	3.6
Several body parts ^f	26	11	4	41	3.9
Whole body ^f	6	0	0	6	0.6
Other and unreported ^f	2	1	0	3	0.3
Total	336	431	291	1,058	100.3

a-f) Refer to the groups used in Table 3.

 TABLE 3

Self-rated health of persons reporting effects of injuries by body region, and a matched reference group.

Body part affected	Any part	Head ^a	Neck ^b	Back ^c	Knee ^d	Arms, legs ^e	Other or several injuries ^f	Reference group
No. of persons	1,058	79	109	250	197	362	61	1,058
Mean age, years (SD)	47 (17)	49 (17)	44 (14)	49 (17)	41 (16)	48 (18)	53 (16)	47 (17)
Good or really good health, %	60*	65*	52*	46*	76*	67*	34*	78
Well enough to do what you want to do,%	64*	67*	56	52*	74*	71*	46*	80
<i>Within the past 14 days, %</i>								
Shoulder or neck pain or disorder	50*	46*	83*	51*	39	44*	64*	33
Back pain or disorder	45*	35	51*	75*	29	28	66*	29
Arm or leg pain or disorder	53*	39	51*	51*	57*	52*	70*	29
Headache	31*	35*	62*	26	30	24	33*	20
Anxiety or nervous	11*	13	12	14*	12	9	7	8
Sleeping problems	28*	32*	38*	28*	25	24*	30*	19
Depressed or unhappy	12*	11	15*	14*	11	10	13	8
Fatigue	38*	38*	50*	37*	32	37*	43	28

SD = standard deviation.

*) Significantly different from a reference group matched by age, sex, and education.

a-f) Refer to the groups in Table 2.

to the Hospital Discharge Register. Finally, it is possible that some injuries have been treated in other countries, e.g. skiing injuries.

The strength of the present study is that it includes all injuries, whether they were treated at a hospital or not. However, there are also some limitations. Firstly, the cause of the effects may be uncertain or have been wrongly reported by the respondents. There may be differences in the interpretation of "unintentional injury" as there was no opportunity to clarify the concept in the interview. Another limitation may be that people who had very severe injuries were unable to participate in the interview. This may result in under reporting and thus underestimation of the number of people with late effect of injuries. Finally, it should be emphasized that both the effects and the health data are self-reported and correlations between these may occur as an effect of reporting bias.

In conclusion, long-term effects of injuries are prevalent in the adult population, with falls and traffic injuries causing most of these effects. Prevention of these injuries may considerably reduce the burden of injury.

CORRESPONDENCE: *Bjarne Laursen*, Institut for Folkesundhed, Syddansk Universitet, 1353 Copenhagen K, Denmark. E-mail: bjla@sdu.dk

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