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Original Article

Clinical Characteristics Associated with Physical Violence in the Elderly: A Retrospective Multicenter Analysis

Dong Hoon Lee [1], Sang Soo Han [2], Duk Ho Kim [3], Eui Chung Kim [4], Eun Hae Lee [5], Ju Ok Park [5], *Choung Ah Lee [5]

1. *Department of Emergency Medicine, College of Medicine, Chung-Ang University, Seoul 06973, Republic of Korea*
2. *Department of Emergency Medicine, Soonchunhyang University Bucheon Hospital, 170 Jomaru-ro, Bucheon, Republic of Korea*
3. *Department of Emergency Medicine, Eulji University, Seoul 01830, Republic of Korea*
4. *Department of Emergency Medicine, CHA University School of Medicine, Seongnam-si 13496, Republic of Korea*
5. *Department of Emergency Medicine, Hallym University Dongtan Sacred Heart Hospital, Hwaseong-si, Gyeonggi-do 18450, Republic of Korea*

***Corresponding Author:** Email: cuccum@hanmail.net

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Abstract

Background: Elder abuse is predicted to increase with the rapid population ageing in many countries. Violent injury is influenced by individual factors as well as interpersonal and social relationships, with different manifestations based on changes in the socioeconomic position of older adults. We comparatively investigated the clinical and injury characteristics of physical violence in the elderly with those in another age group.

Methods: We included elderly patients (age ≥65 years) who visited six emergency departments (ED) with violence-induced injuries in 2017. The control group comprised patients aged 45–64 years, selected by 1:2 matching based on hospital and sex. Data were extracted from the National Emergency Department Information System and electronic medical records. Both groups were compared for injury mechanism, injury location, activity during injury, diagnosis, and clinical outcomes.

Results: Among the 316,944 patients who presented to the 6 ED, 89,178 (28.1%) had traumatic injuries, and 1.6% and 4.5% of injuries were sustained due to violence in the ≥65 and 45–64 year age groups, respectively. There were no significant intergroup differences in the perpetrator (P=0.27), body parts affected (P=0.63), and diagnosis (P=0.23), whereas the older adult group had a significantly higher proportion of traumatic injury by fall (P=0.01), at road and traffic facilities (P=0.01), during work (P=0.01), and multiple injuries (P<0.01).

Conclusion: The increase in non-regular workers in the elderly after retirement may have increased the risk of traumatic workplace injuries. As workplace injuries may be a new risk factor for physical violence in the elderly, institutional workplace injury prevention policy is needed.

Keywords: Workplace violence; Physical violence; Violence

Introduction

Violence against older adults is a global public health issue (1) that results in serious consequences for the victims, including increased risk of morbidity, mortality, and hospitalization (2,3). A review study from 52 studies conducted in 28 countries revealed that the prevalence rate for

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overall elder abuse was 15.7% (4). However, these rates are likely to be underestimated, because elder abuse is often carried out by caregivers at home or nursing home, and only a part of them get reported.

With the increasing proportion of ageing adults in the society, the social roles and activities of older adults are changing. The proportion of elderly couples who living alone has been steadily increasing, and their Activities of Daily Living and Instrumental Activities of Daily Living have steadily increased as well, which reflects an increase in the physical function status and independence (5). However, the elderly remain vulnerable to all injuries, including violence. As violence occurs in interpersonal and social relations, we hypothesized that the social structure and physical and social changes in the older adults are related to the pattern and clinical course of violent injuries.

This study was conducted to examine the characteristics of elderly patients who were admitted to the emergency department (ED) due to violent injuries and to comparatively evaluate the characteristics with those of middle-aged adults with similar injuries.

Methods

Study setting and participants

This study included older adult patients (age ≥65 years) who presented to the ED with interpersonal violence injuries between January and December 2017 at six university hospitals in the metropolitan area of Korea. Based on the Life Course Perspective, middle-aged adults (age 45–64 years) with similar presentation were included as a control group (6).

Data collection

Information on the study participants was extracted from the database of the National Emergency Department Information System (NEDIS) of South Korea, which is a national government system that has been in operation since 2003 and collects data from more than 150 Korean emergency centers. The following NEDIS data variables obtained from the ED visits of participants were analyzed: age, sex, mode of arrival, initial vital signs, initial mental status, Acuity Triage Scale, main department for treatment, intentionality of injury, injury date and time, and disposition (7). Korean Triage and Acuity Scale was applied for the Acuity Triage Scale, that is consists of a five-level system based on the Canadian Triage and Acuity Scale (8). The intentionality of injury is divided into non-intentional injury, self-inflicted injury, and violence injury. Among them, patients corresponding to violence injury were extracted. The elderly patients with violent injuries were first selected as a case group. In the middle-aged patient group, patients with violent injury were defined as the control group and selected by 1:2 matching with the case subjects on the basis of hospital and sex.

After extracting the patient data from the NEDIS database, emergency physicians with more than 10 years' of experience in the ED reviewed the patients' electronic medical records (EMR) to identify the patient's clinical characteristics. Moreover, other variables, including medical history, perpetrator, injury mechanism, injury place, activities when injured, alcohol-related injury, injured body parts, and final diagnosis, were assessed.

Variables

Perpetrators were classified as strangers, family, and persons within social relationships, and the injury mechanism was classified as struck by person or object, fall, firearm/cut/stabbing, and others. The injury places were divided into households, roads and transportation facilities, commercial facilities, and others. Activities during the injuries were categorized into daily life, leisure, work, and others. An alcohol-related injury was defined as one that occurred when the perpetrator or victim was consuming alcohol. The final diagnosis reflects the most severe injury according to the International Classification of Diseases 10th Revision (ICD-10) code and a review of the injury narratives. The injured site (body part) and injury type were classified by the

final diagnosis. The injured anatomical sites were categorized into the head and neck (including the face), torso (including the thorax, abdomen, back, pelvis, and genitals), upper extremity (including the shoulders, upper arms, elbows, forearms, wrists, and hands), and lower extremity (hips, thighs, knees, lower legs, ankles and feet). The injury types were divided into contusion, open wound, fracture/dislocation, sprain/strain, internal hemorrhage, and others.

Statistical analysis

All statistical analyses were performed using IBM SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables are presented as medians with interquartile ranges, and categorical variables were presented as frequencies with proportions (%). We have presented descriptive statistics for the numbers and percentages of the study population. The chi-square test was used for between-group comparisons among the categorical variables. Statistical significance was set at a *P*-value less than 0.05.

Ethics statement

This study was approved by the institutional review boards of each hospital (Approval number: HDT 2018-07-016), and the need for patient informed consent was waived.

Results

A total of 316,944 patients presented to the six EDs in 2017. Of these, 89,178 (28.1%) had traumatic injuries; there were 9,307 (10.4%) and 20,340 (22.8%) patients in the ≥65 and 45–64 years study groups, respectively. The proportion of violent injuries in the ≥65-year and 45–64-years groups was 1.6% and 4.5%, respectively. The details of selecting the cases is presented in Fig. 1.

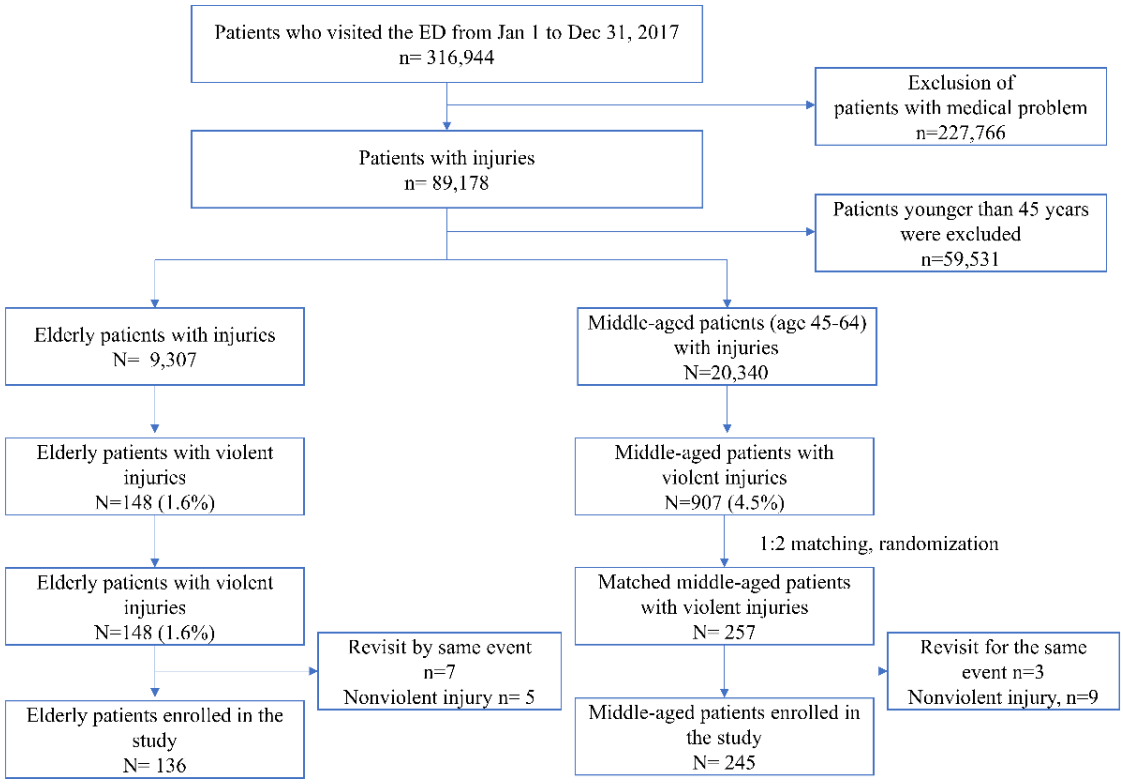

Fig. 1: Flow chart depicting enrolment of study participants

Overall characteristics of elderly patients with physical abuse

Table 1 shows the general characteristics of the elderly and the middle-aged study groups. The median age of both groups was 70 and 54 years, respectively, and the proportion of men in both groups was high (65.2% and 61.6%, respectively). A higher proportion of the elderly group had patients with hypertension and diabetes, whereas the rate of malignancy in the younger group was higher, although these were not statistically significant differences. Among the initial vital signs, systolic blood pressure was high in the elderly group, although there was no clinical significance due to the more frequent incidence of hypertension in the elderly group. With regard to the Triage Acuity Scale, Level 4, which indicates semi-urgent need for care, accounted for approximately 60%. After treatment, 81.6% and 74.7% of both groups were discharged normally, and the rate of discharge against medical advice was higher in the middle-aged adult group.

Table 1: Baseline characteristics of elderly patients with physical abuse

Variables	*Total*	*Elderly adults N=136*	*Middle-aged adults N=245*	*P-value*
Sex, male	237 (62.2)	86 (63.2)	151 (61.6)	0.83
Age (median, IOR)	58 (51-67)	70 (67-75)	53 (48-57)	<0.01
Medical disease	144 (37.8)	75 (55.1)	69 (28.2)	<0.01
Hypertension	70 (18.4)	42 (30.9)	28 (11.4)	<0.01
Diabetes	36 (9.4)	16 (11.8)	20 (8.2)	0.28
Heart disease	11 (2.9)	9 (6.6)	2 (0.8)	<0.01
Malignancy	10 (2.6)	2 (1.5)	8 (3.3)	0.51
Psychiatric disease	16 (4.2)	8 (5.9)	8 (3.3)	0.29
Mode of arrival				0.82
Emergency vehicle	243 (63.8)	89 (65.4)	154 (62.9)	
Private transport	134 (35.2)	46 (33.8)	88 (35.9)	
Police car	4 (1.0)	1 (0.7)	3 (1.2)	
Initial vital signs (median, IOR)				
Systolic blood pressure (mmHg)	138 (120–150)	140 (120–151)	130 (120–150)	0.01
Diastolic blood pressure (mmHg)	80 (70–90)	80 (70–90)	80 (70–90)	0.61
Pulse rate (beats/min)	88 (80–99)	86 (78–96)	90 (80–100.5)	0.13
Respiratory rate (cycles/min)	20 (20–20)	20 (18–20)	20 (20–20)	0.23
Body temperature (℃)	36.5 (36.2–36.8)	36.5 (36.2–36.7)	36.5 (36.2–36.9)	0.85
SpO_2 (%)	98 (97–99)	98 (97–99)	98 (97–99)	0.97
Initial mental status				
Alert	370 (97.1)	132 (97.1)	238 (97.1)	0.38
Verbal	6 (1.6)	1 (0.7)	5 (2.0)	
Pain	4 (1.0)	2 (1.5)	2 (0.8)	
Unresponsive	1 (0.3)	1 (0.7)	0 (0.0)	
Triage Acuity Scale				0.33
Level 1	2 (0.5)	2 (1.5)	0 (0.0)	
Level 2	9 (2.4)	3 (2.2)	6 (2.4)	
Level 3	111 (29.1)	43 (31.6)	68 (27.8)	
Level 4	229 (60.1)	79 (58.1)	150 (61.2)	
Level 5	30 (7.9)	9 (6.6)	21 (8.6)	

Main department for treatment				0.21
ED	223 (61.2)	75 (57.4)	155 (63.3)	
Plastic surgery	70 (18.4)	21 (15.4)	49 (20.0)	
Orthopedic surgery	25 (6.6)	11 (8.1)	14 (5.7)	
Ophthalmology	21 (5.5)	11 (8.1)	10 (4.1)	
Neurosurgery	13 (3.4)	5 (5.7)	8 (3.3)	
Others	19 (5.0)	10 (7.4)	9 (3.7)	
Disposition in ED				0.23
Treated and released	294 (77.2)	111 (81.6)	183 (74.7)	
Admitted to general ward	25 (6.6)	10 (7.4)	15 (6.1)	
Admitted to intensive care unit	5 (1.3)	2 (1.5)	3 (1.2)	
Transferred to another hospital	2 (0.5)	1 (0.7)	1 (0.4)	
Discharge against medical advice	55 (14.4)	12 (8.8)	43 (17.6)	
Outcome after hospitalization				0.33
Treated and released	26 (86.7)	9 (75.0)	17 (94.4)	
Transferred to another hospital	2 (6.7)	1 (8.3)	1 (5.6)	
Discharge against medical advice	1 (3.3)	1 (8.3)	0 (0.0)	
Death	1 (3.3)	1 (8.3)	0 (0.0)	

IQR, interquartile range; SpO_2, oxygen saturation in the blood; ED, emergency department

Injury characteristics of elderly patients with physical abuse

Violence from strangers was the commonest cause of injury in the elderly and middle-aged adult groups (51% and 41.2%, respectively). In both groups, being struck by a person or object was the commonest injury mechanism in both groups (80.1% and 86.1% in the elderly and middle-aged adult groups, respectively), although the incidence of fall-related injury was significantly higher in the elderly (12.5% vs 3.7%) (Table 2).

The most frequent location of injury was the home for the elderly (41.6%) and commercial facilities for the middle-aged adults (40.8%). Violent injuries occurred more frequently on roads and in traffic facilities in the elderly group (22.1%). In the elderly, the most frequent injuries were from 6 pm to midnight, followed by noon to 6 pm and 6 am to noon. However, there was no difference in the injuries by the day of the week.

The main activities at the time of injury were undertaken in the course of daily life and leisure life in both groups. In the elderly, occupational injury accounted for 16.9% or all injuries, which was about three times higher than that in the middle-aged adult group. Alcohol-related injury rates were lower in the elderly than in the middle-aged adults (45.1% vs 73.2%). The site of injury did not differ for the two groups, although the elderly participants had a significantly higher incidence of multiple injuries.

Head and neck injuries were the commonest sites of injury in both groups. In the elderly group, multiple injuries were about 1.5 times more common than in the middle-aged adult group. The most frequent diagnosis was contusions, followed by open wounds and fracture/dislocation, and there was no significant between-group difference.

Information of the perpetrator, injury location, activities when injured, and alcohol-related injury were insufficient and 108, 174 116, and 168 were excluded from the analysis, respectively.

Table 2: Injury characteristics of elderly patients with physical abuse

Variables	*Elderly adults N=136*	*Middle-aged adults N=245*	χ^2	*P-value*
Perpetrator*			2.61	0.27
Stranger	49 (51.0)	73 (41.2)		
Family	24 (25.0)	49 (27.7)		
Persons within social relation-ships	23 (24.0)	55 (31.1)		
Mechanism of injury			12.03	0.01
Struck by person or object	109 (80.1)	211 (86.1)		
Fall	17 (12.5)	9 (3.7)		
Firearm/cut/stabbing	8 (5.9)	23 (9.4)		
Others	2 (1.5)	2 (0.8)		
Injury location*			10.89	0.01
Home	32 (41.6)	52 (40.0)		
Road and traffic facilities	17 (22.1)	17 (13.1)		
Commercial facilities	17 (22.1)	53 (40.8)		
Others	11 (14.3)	8 (6.2)		
Injury day of the week			0.29	0.59
Monday–Friday	92 (67.6)	159 (64.9)		
Saturday and Sunday	44 (32.4)	86 (35.1)		
Time of injury			12.76	0.01
0–6	16 (12.6)	58 (26.1)		
6–12	19 (15.0)	26 (11.7)		
12–18	35 (27.6)	36 (16.2)		
18–24	57 (44.9)	102 (45.9)		
Activities when injured*			11.32	0.01
Daily life	43 (48.3)	87 (49.4)		
Leisure	29 (32.6)	78 (44.3)		
Work	15 (16.9)	10 (5.7)		
Others	2 (2.2)	1 (0.6)		
Alcohol-related injury*	32 (45.1)	104 (73.2)	16.27	0.00
Body parts affected			1.72	0.63
Head and neck	96 (70.6)	176 (71.8)		
Torso	23 (16.9)	32 (13.1)		
Upper extremity	13 (9.6)	31 (12.7)		
Lower extremity	4 (2.9)	6 (2.4)		
Number of injured sites			10.30	<0.01
Single lesion	80 (58.8)	183 (74.7)		
Multiple lesions	56 (41.2)	62 (25.3)		
Diagnosis			4.99	0.42
Contusion	61 (44.9)	95 (38.8)		
Open wound	37 (27.2)	94 (38.4)		
Fracture/dislocation	29 (21.3)	41 (16.7)		
Sprain/strain	3 (2.2)	5 (2.0)		
Internal hemorrhage	3 (2.2)	5 (2.0)		
Others	3 (2.2)	5 (2.0)		

* 108, 174 116, and 168 were excluded from the analysis, respectively due to insufficient information

Discussion

This study reveals the clinical characteristics associated with traumatic injuries sustained by physical violence against elderly patients who visited the ED. We found no differences in the perpetrator, the body part that was affected, and the diagnosis between the elderly and the middle-aged adult group. However, the elderly group suffered more violence by falls, at road and traffic facilities, during work, and multiple injuries.

Between 2019 and 2030, it is estimated that the number of persons in the ≥60 years age group will grow by 38%, from 1 to 1.4 billion, outnumbering the youth globally (9). As the elderly population increases, the rate of violence against them continues to increase even faster. A report estimates that the rate of nonfatal assaults against men aged 60 or older increased by 75.4% between 2002 and 2016, whereas the rate of nonfatal assaults against women in the same age group increased by 35.4% from 2007 to 2016 (10).

The risk of violent injuries depends on the progress of social relations, as well as the physical and mental personal factors. Based on a model, which presented that the risk of violence occurs over the course of the entire life time, and not in some specific age groups, the violent injuries of the elderly were compared with those of the 45–64 year group, which is the age range immediately before the age cutoff for the older adult group. This life-course approach is aimed at increasing the effectiveness of interventions throughout a person's life for which a fundamental factor is the recognition of the importance of the environment and ecological contexts (6,11).

In this study population, compared with middle-aged adults, there was no difference in the elderly group with regard to physical violence, except for the high rate of medical illness, especially hypertension. Because incidence of hypertension is greatest among older adults (12), a high rate of hypertension and high systolic blood pressure was noted in the older adult patients with violent injuries. With regard to the clinical features, there was no difference in the initial severity, consciousness, body part affected, and diagnosis in the different age groups. The disposition in the ER and outcome after hospitalization showed no statistically significant differences by the age group. This is in contrast to a study which reported a higher rate of morbidity and mortality in the elderly (2).

The injury characteristics in the elderly were different from those in the middle-aged participants. The proportion of falls as the injury mechanism was relatively high, and falls are the leading cause of injury-related visits to the ED in the United States, and the primary etiology of unintentional deaths in persons older than 65 years (13). Because of postural hypotension, impairment in balance, and impairment in leg or arm muscle strength or range of motion, the risk of falls is high in the elderly (14). However, in countries where gun ownership is legal, firearms were reported to be the commonest weapons used in homicides (42.2%) (10). It was confirmed that social regulation influenced the mechanism of injury.

The most significant finding of this study is that the proportion of violence in the workforce among the elderly is high. This is assumed to be a reason for the low alcohol-related injury in the elderly group. It is generally known that there are more frequent work-related injuries at a young age because younger workers are more likely to work in more hazardous jobs (15). As many workers extend their working life beyond the normal retirement age (16), the interest in the consequences of injury among older workers has grown (17). The WHO has recommended the maintenance of social relationships and economic independence of the elderly as an intervention to reduce violent injuries (18). However, individual capabilities such as low physical capacity, hearing loss and cognitive function impairment, and workplace factors such as fatigue, work stress, overtime, and shift work, affect the risk of injury to the elderly (19). Of the 15 cases of work-related injury in the elderly that were identified in this study, seven were among taxi or bus drivers, and all were injured by strangers. Four were injured by a drunk customer or a customer who

could not confirm whether to drink at a commercial facility. Two victims were injured while working on the apartment security, and the perpetrator was in a non-drinking state. Work-related violence can affect mental health and physical disability, resulting in significant economic and social costs for employees, families, organizations, and the overall community.

This study had several limitations. First a major limitation was its retrospective design. Because of legal issues associated with crimes, the patients were reluctant to report violence. Experienced experts reviewed the EMR, but information about the perpetrator or the possibility of habitual abuse is insufficient or missing. Second, this study used a multicenter design in a metropolitan area of South Korea and, therefore, selection bias may have occurred and the prevalence could not be ascertained. Therefore, the extent of the traumatic injury was replaced by a ratio based on comparison with other injuries. Third, only physical injuries could be identified because only patients who visited the ED were the focus of this study. Other types of psychological, emotional, financial violence, or neglect were not covered in this study.

Conclusion

Increased social activity and participation in economic activities by older adults can reduce domestic violence, neglect, and financial abuse. However, we found that the elderly were likely to be injured by falls because of physiological factors and the risk for violence in the workplace, which increased accordingly with the increase in the non-standard work of the elderly after retirement. Thus, workplace violence needs to be addressed by an institutional prevention policy as it appears to be a new risk factor for elder abuse.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Disclosure of interest

The authors report that they have no conflicts of interest.

References

1. World Health Organization (2014). Global status report on violence prevention 2014. Geneva: World Health Organization.
2. Dong X, Simon MA (2013). Elder abuse as a risk factor for hospitalization in older persons. *JAMA Intern Med*, 173: 911–7.
3. Chien W-C, Lin J-D, Lai C-H, et al (2011). Trends in poisoning hospitalization and mortality in Taiwan, 1999-2008: a retrospective analysis. *BMC Public Health,* 11: 703.
4. Yon Y, Mikton CR, Gassoumis ZD, et al. (2017). Elder abuse prevalence in community settings: a systematic review and meta-analysis. *Lancet Glob Health*, 5: e147–56.
5. Lee YK. Analysis and Projection of Changes in the Lives of Elderly Koreans. Korea Institute for Health and Social Affairs; 2011.
6. Hosking J, Ameratunga S, Morton S, et al (2011). A life course approach to injury prevention: a "lens and telescope" conceptual model. *BMC Public Health*, 11: 695.
7. Kwak YH, Kim DK, Jang HY (2012). Utilization of emergency department by children in Korea. *J Korean Med Sci*, 27: 1222–8.
8. Kwon H, Kim YJ, Jo YH, et al (2019). The Korean Triage and Acuity Scale: associations with admission, disposition, mortality and length of stay in the emergency department. *Int J Qual Health Care*, 31:449–455.
9. United Nations, Department of Economic and Social Affairs, Population Division. World population ageing, 2019: highlights. New

York: United Nations, 2019.
10. Logan JE, Haileyesus T, Ertl A, et al (2019). Nonfatal Assaults and Homicides among Adults Aged ≥60 Years - United States, 2002-2016. *MMWR Morb Mortal Wkly Rep*, 68: 297–302.
11. Ben-Shlomo Y, Kuh D (2002). A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. *Int J Epidemiol*, 31: 285–93.
12. Pinto E (2007). Blood pressure and ageing. *Postgrad Med J*, 83: 109–14.
13. Choi NG, Choi BY, DiNitto DM, et al. (2019). Fall-related emergency department visits and hospitalizations among community-dwelling older adults: examination of health problems and injury characteristics. *BMC Geriatr*, 19: 303.
14. Fuller GF (2000). Falls in the elderly. *Am Fam Physician*, 61(7):2159-68.
15. Breslin FC, Smith P (2005). Age-related differences in work injuries: a multivariate, population-based study. *Am J Ind Med*, 48: 50–6.
16. OECD (2019). Pensions at a Glance 2019: OECD and G20 Indicators. Paris: OECD Publishing. doi.org/10.1787/b6d3dcfc-en
17. Smith P, Bielecky A, Koehoorn M, et al (2014). Are age-related differences in the consequence of work injury greater when occupational physical demands are high? *Am J Ind Med*, 57: 438–44.
18. Zwi JA, Lozano RA, World Health Organization (2003). World Report on Violence and Health.
19. Fraade-Blanar LA, Sears JM, Chan KCG, et al. (2017). Relating older workers' injuries to the mismatch between physical ability and job demands. *J Occup Environ Med*, 59: 212–21.