Prevalence, circumstances and consequences of non-fatal road traffic injuries and other bodily injuries among older people in China, Ghana, India, Mexico, Russia and South Africa

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ABSTRACT

Unintentional injuries are one of the main contributors to mortality and disability in elderly populations in low- and middle-income countries. The aim of this study was to examine the annual road traffic and other bodily (not including falls) injury prevalence and associated risk factors among older adults across six lower and upper middle-income countries. A cross-sectional survey involving face-to-face household interviews were conducted in China (n=13,177), Ghana (n=4305), India (n=6560), Mexico (n=2318), the Russian Federation (n=3938) and South Africa (n=3840), resulting in population-based cohorts of persons aged 50+ years. Measures included questions on injury, self-rated visual difficulties, alcohol use, depression treatment, sleeping

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problems, self-reported health status, and vision assessment using LogMAR (logarithm of Minimum Angle of Resolution) eye charts. It comprises rows of letters and is used to measure visual acuity. Results indicate that the overall annual non-fatal road traffic injury prevalence was 2.0% and for other bodily injury 2.1% (not including falls) across the six countries. The multivariate logistic regression analysis found that residing in a rural area, taking medications or other treatment for depression in the past 12 months and having a sleeping problem were associated with road traffic injury, while younger age, residing in a rural area, hazardous or harmful alcohol use and having a sleeping problem were associated with other bodily injury. Visual impairment was not associated with prevalence of road traffic injuries. This study provides the burden of non-fatal road traffic injury and other bodily injury and their associated risk factors across the six countries' studies. The findings of this study improves the understanding of non-fatal road traffic injury and other bodily injury upon which policy makers, programme developers and researchers in public health can design strategic interventions to reduce these preventable injuries as well as improve safety associated with unintentional injuries.

Keywords: injury, traffic, ageing, China, Ghana, India, Mexico, Russian Federation, South Africa.

INTRODUCTION

From the total cause of disability-adjusted life years (DALYs) worldwide conducted in 2010, 11% was attributed to injuries (Murray et al., 2012). Over 90% of the DALYs lost occur in developing countries, demonstrating the disparate burden that injuries place on low- and middle-income countries (LMICs) (De Ramirez, Hyder, Herbert, & Stevens, 2012). It is projected that in the next 20 years, the magnitude of injuries is likely to reduce in high-income countries but remain significant in middle-income ones (Norton & Kobusingye, 2013). The pace of population ageing in LMICs is outstripping that in higher-income counterparts (He, Muenchrath, & Kowal, 2012).

Ageing is associated with declining health and negative socio-economic changes. Biologically, there is a steady decrease in mental and physical capacities, increased risk of diseases, and eventually death due to build-up of cellular and molecular damage over the years (WHO, 2015a). The decrease in physical and cognitive capacities can reduce their ability to get around either by walking or by driving or by any other transportation means. Socio-economically, elderly people experience transition to retirement, relocation to smaller homes, and loss of friends and partners due to death (WHO, 2015a).

Efforts to enhance active ageing, with the older people feeling safe and secure in own homes and communities, are needed in order to enhance their quality of life (WHO, 2015c, p. 4). Such efforts will optimise 'opportunities for health, participation and security' (WHO,

2015c, p. 5). Injury prevention for older adults may involve national-level efforts such as designing and implementing programmes addressing violence and suicide prevention and individual-level efforts such as addressing behavioural risks, i.e. 'physical and nutritional aspects, careful prescription of psychotropic drugs, and safe housing' (WHO, 2015b, p .48). There are limited data and resources to develop and implement policies aimed at injury prevention (Chandran, Hyder, & Peek-Asa, 2010; De Ramirez et al., 2012).

In the USA, unintentional injuries are counted among the prominent causes of mortality and disability in older adults (Scheetz, 2011). Older adults who are severely injured suffer far worse health outcomes than younger adults (Scheetz, 2011). 'Non-fall injuries' are a crucial cause of disease and death in older adults. Injuries result not only in the loss of life and human suffering, but in huge economic costs and lifestyle changes (WHO, 2015b). The rates of motor vehicle-related injuries (occupant and pedestrian), suicide, and residential fire are higher in the older segments of the population (Wolf & Rivara, 1992).The top-most causes of injury related to mortality in the 65-plus age group in the United States are falls, motor vehicle-related crashes and suicide (Binder, 2002), in Taiwan they are falls and motor vehicle accidents (Chandran et al., 2010) and in Korea and Ghana they are falls and transport injuries (Kang, 2011; Mock, Abantanga, Cummings, & Koepsell, 1999). Cross-sectional survey data from 2004-05 from LMICs involving 799 older people living in disadvantaged urban areas in four municipalities in Mexico, showed that more than one third (37%) of the participants suffered injuries (Ruelas González & Salgado de Snyder, 2008). Similarly, about 10% of total road traffic deaths took place in adults aged 65-plus in China (Zhang, Xiang, Jing, & Tu, 2011) and in India individuals aged 70-plus suffered the highest unintentional mortality rates (410/100,000) compared to younger age groups (Jagnoor et al., 2012). According to the International Classification of External Causes of Injuries (ICECI, 2004), the different mechanisms of injury can be classified as follows: Blunt force (transport injury event and falling), piercing/penetrating force (cut, pierced, stabbed; shot with firearm or other weapon), thermal mechanism (contact with hot object/substance or hot liquid/gas; contact with fire or flame), threat to breathing (drowning/near-drowning), exposure to chemical or other substance and exposure to effect of weather condition, natural disaster, or force of nature. The scope of this study is to include one major blunt force (transport injury) and all other listed mechanisms of injury.

Studies on the association with non-fatal road traffic injury in older adult groups appear to be associated with per capita income, total length of the road and individual alcohol consumption levels (Nagata, Takamori, Berg, & Hasselberg, 2012). Age has been found to be an independent risk factor of severe motor vehicle-related injury (Newgard, 2008). Vision impairment (Goonewardene, Baloch, Porter, Sargeant, & Punchihewa, 2010; Owsley, 2010; Rubin et al., 2007; Yiengprugsawan et al., 2012), sleep disorders (Papalia et al., 2012), and medical prescription for antidepressants (Bramness, Skurtveit, Neutel, Mørland, &

Engeland, 2008) have also been found to be strongly associated with road traffic injury. Sleep disorders increase the risk of road traffic accidents as they may cause extreme drowsiness (Ebrahimi, Sadeghi, Dehghani, & Niiat, 2015; Goldstein, Ancoli-Israel & Shapiro, 2004). With regard to anti-depressant medication, the accident risk may be associated with depression symptoms, which lead to slower reaction time and lower concentration abilities (Orriols, Wilchesky, Lagarde, & Suissa, 2013). Other factors associated with non-fatal injury (in general) among older adults have been identified as follows: growing older, being employed, having multiple illnesses, taking a number of medicines and remedies, perceiving own health as poor, alcohol drinking, lack of adequate family support and serving as carer of others (Ruelas González & Salgado de Snyder, 2008; Saveman & Björnstig, 2011).

There is little information about injury among older adults in LMICs. The Study on global AGEing and adult health (SAGE) countries' study population represents 43% (700 million) of the global population aged 50-plus and 60% of those living in LMICs. The SAGE dataset allows comparative analysis of national patterns of non-fatal injuries across the six countries' studies. This study is aimed at investigating the annual prevalence of non-fatal road traffic injuries and injuries from other causes, as well as their risk factors in older adults in the six LMICs studied. An assessment of the burden, the scope and the characteristics of non-fatal injuries contributes to a better understanding of the magnitude, contexts and consequences of non-fatal road traffic injuries and other bodily injuries excluding falls.

METHODOLOGY

SAMPLE AND PROCEDURE

Cross-sectional data from SAGE, a longitudinal population-based study with cohorts of individuals aged 50 and older in China, Ghana, India, Mexico, the Russian Federation and South Africa, was analysed (Kowal et al., 2012a). These countries were selected to represent major populations in LMICs across three continents. The cross-sectional survey (SAGE Wave 1) was between 2007 and 2010. The design was multistage cluster sampling (region/province and type of locality), which resulted in nationally representative cohorts of older adults (see www.who.int/healthinfo/sage/cohorts/en/index2.html). Primary sampling units were identified using the probability proportional to size method and households were selected randomly within these units (Kowal et al., 2012a). Face-to-face interviews and health examinations were conducted with all persons aged 50 and older in the selected households (Kowal et al., 2012a). Age and sex distributions in the populations were adjusted using post-stratification weights (Kowal et al., 2012a). Appropriate approvals for the study were secured, i.e. ethics approval was secured from local ethics boards of the respective countries and the WHO and prior to each interview and health examination, the interviewer obtained informed consent from each potential participant.

MEASURES

Questionnaires and survey tools for SAGE were adapted from the World Health Survey (WHS) tools and other surveys about ageing (Kowal et al., 2012a). The psychometric properties of the different instruments and their face validity were assessed through a pilot study conducted in Ghana, India and Tanzania in 2005 (Kowal et al., 2012b).

This study focuses on injury due to road traffic accidents or any other source, excluding falls. The study population is described here by sex (men and women); age (50-59, 60-69, 70-79 and 80-plus years); residence (urban and rural); marital status (never married, married/cohabiting, and divorced/separated/widowed) and level of wealth. Levels of wealth were formulated using a multi-step process whereby the asset ownership was transformed into an asset ladder. The Bayesian post-estimation method was then utilised to formulate raw continuous income estimates, and then transformed into quintiles (Ferguson, Murray, Tandon, & Gakidou, 2003).

INJURY

Injury was assessed with two questions: (1) “In the last 12 months, have you been involved in a road traffic accident where you suffered from bodily injury?” and (2) “In the last 12 months, have you had any other event where you suffered from bodily injury?” For those with a non-road traffic-related injury, further questions were posed regarding the location and the cause of injury: “Where were you when you were injured?” (home, school, work, other). “What was the cause of this injury?” (fall, struck/hit by a person or object, stabbed, gunshot, fire, flames or heat (burn), drowning or near-drowning, poisoning, animal bite, electricity shock, other). The results presented in this paper do not include fall-related injuries, which is the subject of a separate analysis (Stewart Williams et al., 2015).

For both road traffic and other bodily injury, further questions were asked about the injury, any medical care the respondent may have received and any resulting physical disability based on WHO’s injury surveillance guidelines (WHO, 2002).

VISION

The following question was posed to assess self-rated visual difficulties: “In the last 30 days, how much difficulty did you have in seeing and recognising an object or a person you know from across the road (from a distance of about 20 metres)?” The response categories ranged from none=1 to extreme/cannot do=6. Visual difficulty was here defined as severe or extreme/cannot do.

EYESIGHT

LogMAR eye charts were used to assess levels of myopia and hyperopia. The test used standard lighting and corrected vision as per the individual respondent's situation. The acuity test was administered in a 'forced choice' fashion; that is, the respondent was instructed to provide a response, and to guess when uncertain. Individuals with vision of ≤20/70 are considered to have low vision or to be partially sighted for distance or for seeing near. A 20/70 vision means that a person needs to be at a 20-foot (1 foot=0.3048 metre) distance in order to be able to see what an individual with normal vision can see at a distance of 70 feet.

ALCOHOL USE

Lifetime alcohol use was determined through posing a question: "Have you ever consumed a drink that contains alcohol (such as beer, wine, spirits, etc.)?" Those who indicated that they had used alcohol, were further asked about patterns of alcohol use: "During the past 7 days, how many drinks of any alcoholic beverage did you have each day?" Risky alcohol use was defined as ≥10 alcoholic drinks in the preceding week (National Institute on Alcohol Abuse and Alcoholism, 2005).

DEPRESSION TREATMENT

Depression treatment was assessed with the question: "Have you been taking any medications or other treatment for depression during the last 12 months?"

SLEEPING PROBLEMS

Sleeping problems were explored using the question: "Overall in the last 30 days, how much of a problem did you have with sleeping, such as falling asleep, waking up frequently during the night or waking up too early in the morning?" Response options were from 1=none to 5= extreme/cannot do. The categories severe or extreme/ cannot do were regarded as having sleeping problems.

SELF-REPORTED HEALTH STATUS

Self-reported health status was assessed by asking participants how they would rate their health today on a 5-point Likert scale (1=very good to 5=very bad). This variable was recoded into bad/very bad vs. moderate/good/ very good.

DATA ANALYSIS

Descriptive statistics were used to describe the data. Unconditional multivariable logistic regression analyses were used for assessing the impact of explanatory variables for the outcomes of road traffic injury and other bodily injury (except falls) (binary-dependent variables), separately. All variables statistically significant at the $p<.05$ level in bivariate analyses were included in the multivariable models. Weighted percentages are reported (Kowal et al., 2012a). Both the reported 95% confidence intervals and the p-value are adjusted for the multi-stage stratified cluster sample design of the study. The data was analysed using STATA Version 11 (StataCorp, 2009).

RESULTS

SAMPLE CHARACTERISTICS

Table 1 shows the socio-demographic characteristics of the study population by country with China (n=13,177) being the largest and Mexico (n=2,318) being the smallest samples of population aged 50-plus. The distribution of the population between urban and rural locations in the pooled dataset was similar (46.2% urban vs. 53.8% rural). The sex distribution was similar across countries (52.1% women vs. 47.9% men), except in the Russian Federation, which consisted of 38.9% men and 61.1% women. The 50- to 59-year age group was the largest proportion of respondents in all countries. In most countries, the majority of participants completed secondary or high school and the Russian Federation had the highest completion rates of secondary or high school (74.7%) and post-secondary education (18.4%). Overall, 7.2% rated themselves as having visual difficulties, 8.4% were risky alcohol users, 0.6% had taken treatment for depression in the past 12 months, and 6.8% reported a sleeping problem (see Table 1).

Table 1: Socio-demographic and health variable characteristics (as percentage) by country, SAGE Wave 1

	China	Ghana	India	Mexico	Russian Federation	South Africa	Pooled
Total Population n=	13,177	4,305	6,560	2,318	3,938	3,840	34,138
Residence							
Urban	47.4	41.1	28.9	78.8	72.7	64.9	46.2
Rural	52.7	58.9	71.1	21.2	27.3	35.1	53.8
Gender							
Male	49.8	52.5	51.0	46.8	38.9	44.1	47.9
Female	50.3	47.6	49.0	53.2	61.1	56.0	52.1

Age Group							
50-59	44.9	39.7	48.6	48.1	45.2	49.9	46.4
60-69	31.9	27.5	30.9	25.6	24.6	30.6	30.0
70-79	18.6	23.1	16.0	17.8	21.8	14.0	18.2
80+	4.6	9.7	4.5	8.6	8.4	5.5	5.4
Marital Status							
Never married	1.1	1.3	0.7	7.0	2.7	14.3	1.8
Married/Cohabitating	85.0	59.3	76.9	73.0	58.3	55.9	75.5
Sep/Divorced/Widowed	13.8	39.4	22.3	20.0	39.0	29.8	22.8
Employment							
Not employed	22.9	93.8	99.7	42.3	97.0	46.7	38.8
Employed	77.1	6.2	0.3	57.8	3.0	53.3	61.2
Income Quintile*							
Lowest	16.3	18.2	18.2	15.3	16.2	20.7	17.2
Second	18.1	19.1	19.5	24.7	19.6	19.9	19.0
Third	20.5	20.5	18.8	16.8	19.1	18.2	19.5
Fourth	23.4	20.7	19.6	16.6	20.5	19.8	21.3
Highest	21.8	21.6	23.9	26.6	24.6	21.3	23.1
Education Level							
No primary completed	24.6	22.6	20.6	46.3	1.3	32.8	17.4
Primary	27.3	23.8	30.4	29.0	5.6	29.7	22.2
Secondary/HS	42.2	45.8	38.5	14.9	74.7	30.0	49.9
University/College	5.8	7.8	10.5	9.8	18.4	7.5	10.6
Poor subjective health status	20.5	16.9	20.9	12.5	28.2	16.4	20.0
Visual difficulties	3.1	10.6	17.1	7.0	4.7	6.4	7.2
Risky alcohol use	12.2	9.6	1.1	1.4	4.2	3.6	8.4
Depression treatment	0.2	0.7	1.2	2.6	1.7	4.8	0.6
Sleeping problem	2.8	15.0	5.7	9.7	9.3	7.4	6.8

* Notes. Lowest wealth quintile indicates relative economic disadvantage and highest indicates relative economic advantage.

ANNUAL INJURY PREVALENCE

The annual road traffic injury (RTI) prevalence was 2.0% and for other bodily injury was 2.1%. Across study countries, the highest RTI prevalence was in India (2.4%) and Russia (2.4%) and the highest other bodily injury (OI) was in Ghana (2.8%) and India (2.6%). Almost 9 in 10 (88.7%) believed that their RTI was unintentional, while 23.3% in Russia, 22.7% in Ghana and 20.7% in South Africa felt that their RTI was intentionally caused by someone.

The major cause of other bodily injury (excluding falls) was struck/hit by a person (9.2%), followed by stabbing (5.2%), animal bite (2.2%), and fire/flames/heat-related (1.3%). The place of bodily injury was mainly at home (46.7%), in particular in India (64.1%) and South Africa (52.9%). Regarding other bodily injury, 88.8% indicated that they were unintentional, while in Mexico and in South Africa a large proportion believed the injury was intentionally caused by someone (see Table 2).

Table 2: Injury type for countries and total, by cause, place and intentionality, SAGE Wave 1

	All	China	Ghana	India	Mexico	Russian Federation	South Africa
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
	Injury in the past 12 months						
Road traffic injury	2.0 (1.3-2.3)	1.8 (0.9-2.7)	1.7 (0.2-2.0)	2.4 (1.8-3.0)	1.7 (0.8-2.6)	2.4 (1.5-3.3)	1.8 (0.9-2.6)
Other bodily injury (except falls)	2.1 (1.8-2.5)	2.1 (1.6-2.6)	2.8 (2.2-3.4)	2.6 (2.0-3.2)	1.4 (0.4-3.2)	0.9 (0.5-1.4)	0.4 (0.2-0.7)
	Cause of other bodily injury (except falls)						
%	%	%	%	%	%	%	%
Struck/hit by person	9.2	10.4	36.2	7.8	25.6	4.6	14.3
Stabbed	7.4	13.1	2.2	0.6	—	4.3	0.3
Gun shot	0.1	0.3	—	—	0.2	—	—
Fire/flames or heat	1.3	1.7	1.4	1.1	—	1.1	3.8
Drowning or near-drowning	0.1	0.2	0.1	—	—	—	—
Poisoning	0.6	0.6	—	0.5	—-	—	—
Animal bite	2.1	1.3	3.3	2.8	—	2.5	2.2
Electric shock	0.3	0.1	0.2	0.3	—	2.7	—
Other	12.3	11.0	9.0	14.2	6.7	9.5	7.2
Don't know	0.3	0.1	2.0	0.3	0.3	5.7	3.5
Not applicable	0.1	—	0.4	0.1	—	—	2.6
	Place of other bodily injury (except falls)						
Home	46.7	45.7	26.8	64.1	37.2	45.3	52.9
School	2.3	1.0	0.4	2.3	0.5	5.3	0.0
Work	35.0	32.4	67.3	20.5	5.9	31.0	40.2
Other	15.0	20.2	5.2	12.6	56.4	0.0	3.9
	Intentionality of road traffic injury						
Un-intentional	87.7	89.9	71.7	87.2	78.3	64.9	69.9

Intentionally by someone	6.8	1.6	22.6	10.3	0.0	23.3	20.7
Self-inflicted	5.4	8.6	—	2.2	21.7	0.0	—
Intentionality of other bodily injury (except falls)							
Un-intentional	88.8	93.1	95.6	78.0	34.7	92.0	47.3
Intentionally by someone	4.4	1.1	3.7	10.0	65.3	6.7	45.7
Self-inflicted	6.4	5.8	0.0	11.0	0.0	0.0	4.3

INJURY CONSEQUENCES

More than two-thirds of older adults (68.5%) received medical care or treatment for their RTI and 60.7% for OI. The proportion receiving medical care for RTI was far more in India and for OI in South Africa, with the lowest treatment levels received for both types of injuries in Mexico. About one in five (17.8%) suffered physical disability as a result of RTI and 14.0% as a result of OI. For both categories of injury, the three major forms of physical disability included 'difficulty to use hand or arm', 'unable to use arm' and 'walk with a limp'. (See Table 3).

Table 3: Injury consequences (percent) for road traffic incidents and other injuries in each country and total, SAGE Wave 1

Variables	All	Male	Female	China	Ghana	India	Mexico	Russian Federation	South Africa
Received medical care or treatment for road traffic injuries	65.3	68.6	60.8	63.3	55.1	71.0	54.3	62.0	65.9
Suffered physical disability as a result of RTI	17.4	17.6	17.2	13.5	24.4	33.4	14.3	2.9	20.9
Received medical care or treatment for other bodily injuries (except falls)	60.7	59.6	62.1	62.5	64.2	58.6	19.2	46.6	91.2
Suffered physical disability as a result of other bodily injuries (except falls)	14.0	12.8	15.6	10.4	11.1	22.0	13.1	0.8	57.3

Unable to use RTI1	10.6	7.0	15.2	7.1	12.0	23.8	5.3	0.0	2.7
arm OI2	14.0	4.8	12.0	5.2	12.1	21.1	0	39.4	8.9
Difficulty to use RTI	18.2	18.1	18.4	10.1	9.9	48.3	2.7	39.4	18.6
hand or arm OI	13.8	15.2	12.1	10.1	23.5	30.0	0	39.6	20.8
Walk with a RTI	9.4	9.2	9.7	6.3	30.3	18.6	62.6	39.4	11.1
limp OI	7.3	6.4	8.4	2.6	35.6	28.3	0	0	15.9
Loss of hearing RTI	0.7	1.4	0	0	30.3	0.8	0	0	8.7
OI	0.2	0	0.5	0.9	35.6	1.4	0	8.0	0
Loss of vision RTI	0.5	0.1	1.0	0	0.0	2.0	0	39.4	0
OI	0.9	0.8	0.9	0	0.0	2,4	0	36.2	0
Weakness or shortness of RTI	2.1	3.3	0.6	0.4	8.4	3.6	0	0	0
breath OI	0.9	1.4	0.4	1.4	16.7	5.1	0	0	0
Inability to RTI	0.1	0.1	0	0	13.2	0	0	39.4	11.4
remember things OI	0.3	0	0.6	0	9.6	1.1	0	0	13.3
Inability to chew RTI	0.6	0.5	0.6	0	0.0	2.7	0	0	0
OI	0.2	0	0.5	0	0.0	11.4	0	0	0
Other RTI	9.9	10.1	9.7	10.3	33.6	8.2	32.4	8.0	16.4
OI	5.1	6.7	3.3	4.1	4.6	9.1	0	0	44.9

1RTI=Road Traffic Injury; 2OI=Other Bodily Injury (not including falls)

ASSOCIATION WITH INJURIES

Multivariate logistic regression analysis found that residing in a rural area, taking medications or other treatment for depression in the past 12 months and having a sleeping problem were associated with road traffic injury, while younger age (50-59 years), residing in a rural area, hazardous or harmful alcohol use and having a sleeping problem were associated with other bodily injury (see Table 4).

Table 4: Odds ratios for likelihood of road traffic and other injuries, by selected background characteristics and health variables, SAGE Wave 1

	Road traffic injuries		Other bodily injuries (not including falls)	
	Crude Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)	Crude Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)
Sociodemographics				
Age				
50-59	1.00	—	1.00	1.00
60-69	0.95 (0.73-1.23)		0.90 (0.64-1.28)	0.89 (0.63-1.26)
70+	0.75 (0.55-1.02)		0.52 (0.36-0.75)***	0.52 (0.36-0.76)**
Gender				
Female	1.00	—	1.00	1.00
Male	1.23 (0.96-1.57)		1.27 (1.01-1.59)*	1.15 (0.92-1.44)
Education in years				
0-4	1.00	1.00	1.00	—
5-8	0.85 (0.61-1.20)	0.96 (0.66-1.34)	0.95 (0.65-1.38)	
9 or more	0.70 (0.51-0.97)*	0.98 (0.68-1.42)	0.71 (0.45-1.10)	
Residence				
Rural	1.00	1.00	1.00	1.00
Urban	0.52 (0.40-0.69)***	0.48 (0.34-0.68)***	0.58 (0.41-0.81)***	0.61 (0.44-0.85)**
Wealth quintile				
Lowest	1.00	—	1.00	—
Low	0.89 (0.57-1.38)		0.80 (0.52-1.22)	
Medium	1.32 (0.80-2.15)		1.03 (0.67-1.57)	
High	1.25 (0.86-1.80)		0.76 (0.48-1.19)	
Highest	0.80 (0.57-1.41)		0.73 (0.46-1.17)	
Health variables				
Subjective health status				
Moderate/good/very good	1.00	1.00	1.00	—
Very bad/bad	1.50 (1.20-2.00)**	1.08 (0.76-1.54)	1.12 (0.85-1.48)	
Visual difficulties (self-rated)				
None/mild/moderate	1.00	—	1.00	—
Severe/extreme	1.23 (0.84-1.81)		1.08 (0.62-1.89)	
Low visual acuity				
Distant vision (base=normal)	1.07 (0.76-1.52)	—	0.79 (0.50-1.25)	—
Near vision (base=normal)	1.12 (0.83-1.51)	—	1.14 (0.86-1.52)	—

Alcohol use				
0-9 drinks a week	1.00	1.00	1.00	1.00
≥10 drinks a week	1.67 (1.15-2.43)**	1.35 (0.99-1.84)	1.99 (1.30-3.04)***	1.86 (1.09-2.55)*
Depression treatment				
No	1.00	1.00	1.00	—
Yes	3.13 (1.53-6.40)**	2.61 (1.04-6.54)*	0.75 (0.24-2.31)	
Sleeping problem				
None/mild/moderate	1.00	1.00	1.00	1.00
Severe/extreme	1.88 (1.22-2.90)**	1.69 (1.03-2.76)*	1.66 (1.00-2.77)*	1.86 (1.08-3.20)*

***p<0.001; **p<0.01; *p<0.05

DISCUSSION

This study found an overall annual road traffic injury and other bodily injury (excluding falls) prevalence of 2.0% and 2.1%, respectively. This finding seems similar to the results of the study which was conducted in Canada (Bouchard, Pickett, & Janssen, 2010), but is lower than in a few other studies (e.g. Ruelas González & Salgado de Snyder, 2008). Of greatest concern is the fact that the time to recover from an injury among the elderly is long, given the slow recovery process at a time when most of them have to live alone due to changing social life patterns characterised by the breakdown of extended family systems (Nagata, Uno, & Prry, 2010). Thus, injury may compromise the quality of life affecting essential daily activities (Nagata et al., 2012).

Several factors that increase the risk of non-fatal injuries which require multifaceted and targeted interventions were identified. It revealed that road traffic crashes were a prominent contributor to injury, confirming the results of several other studies (Binder, 2002; Chien, Chung, Lai, & Chou, 2014; Cunningham, Carter, Connor, & Fawcett, 2010; Mock et al., 1999; Nagata et al., 2012; Ruelas González & Salgado de Snyder, 2008). Furthermore, the highest annual prevalence of any injury (road traffic and other bodily injury not including falls) was in India (5.0%) and the lowest in South Africa (2.2%). For India, globally, it has been found that road traffic injuries put pressure on the already overburdened healthcare system, facilities and constrained budgets (Garg & Hyder, 2006). Globally, South Africa has exceedingly high numbers of road traffic injury – double the global rate (Norman, Matzopoulos, Groenewald, & Bradshaw, 2007). In Russia, road traffic victims were found to be seven times more likely to require hospitalisation compared with victims of other types of trauma (Marquez & Bliss, 2010). Road traffic injuries accounted for 75% of all types of injury, with victims of road traffic crashes representing more than 60% of severe trauma cases (Marquez & Bliss, 2010). In Russia, the

cost of medical services with regard to traffic-related injuries and associated external causes consumed about 0.27% of GDP in 2003, or about USD1.2 billion (World Bank, 2005).

The study showed that older persons in rural areas were more likely to experience road traffic injury and other bodily injury compared to their urban counterparts. The findings of the study in this regard are in line with those of previous studies in the study countries. For example, higher road traffic injuries were experienced in the rural areas of China and Ghana as well as among the elderly (Afukaar, Antwi, & Ofosu-Amaah, 2003; Huang et al. 2013; Zhang et al., 2012). This may be attributed to poor road infrastructure in rural areas where there are hardly any sidewalks, bicycle lanes, traffic signals, traffic control systems or speed cameras (Afukaar et al., 2003; Zhang et al., 2012). This puts the elderly people in a more vulnerable or unfavourable environment (Zhang et al., 2012). It is necessary to improve or set up traffic safety systems in order ensure a safe road traffic environment for all older adults, especially those in rural areas (Zhang et al., 2012). The growing rate of rapid motorisation, particularly in rural areas across the LMICs investigated, coupled with inadequate transport systems, increase the risk to older persons.

In agreement with a study in Mexico (Ruelas González & Salgado de Snyder, 2008), this study found that consumption of alcoholic beverages were associated with injury prevalence. As found in another study (Bramness et al., 2008), this study found an association between depression treatment and road traffic injury. Bramness et al. (2008) could not detect whether the increase was due to the antidepressant, the effect of the depression, or the profile of the patients who received these drugs. Furthermore, this study found, in agreement with other studies (Papalia et al., 2012), that sleeping problems were associated with the annual prevalence of both road traffic and other bodily injury. It is possible that sleep disorders may cause high levels of drowsiness and increase the risk of road traffic accidents (Ebrahimi et al., 2015; Goldstein et al., 2004). Further research should be conducted to determine the types of sleep disorders that increase the risk of road traffic accidents so that interventions may be targeted to these. Contrary to some previous studies (Goonewardene et al., 2010; Owsley, 2010; Rubin et al., 2007; Yiengprugsawan et al., 2012), this study did not find an association between vision impairment and road traffic injury.

In terms of the proportion of the types of other bodily injuries, a large proportion was attributed to interpersonal violence (struck/hit by person or stabbed). Interestingly, other bodily injuries went down with increasing age. Findings indicate that interventions to reduce injuries in older adults should also specifically address interpersonal violence, and may indicate a need to investigate longer-standing abuse of older adults. As found in other studies (e.g. Kang, 2011), most non-road traffic injuries in this study occurred at home. As a consequence, interventions for the prevention of other bodily injuries should be targeting the home environment. This study found that, particularly in Ghana and South Africa, a

large proportion (over 20%) felt that their road traffic injury was intentionally caused by someone. Previous studies in West Africa and South Africa found high proportions of the belief that accidents were intentionally caused, including supernatural forces (Kouabenan, 1998; Peltzer & Renner, 2003). For South Africa, a large proportion (15.6%) indicated that their other bodily injury was caused by someone intentionally. This may be a reflection of high rates of interpersonal violence in South Africa (Peltzer & Renner, 2003).

About two-thirds of the older adults received medical care or treatment for their road traffic injury and for other bodily injury. The proportion of those suffering physical disability from road traffic injuries and other bodily injuries was high, reflecting the increased vulnerability among the older adult population (Scheetz, 2011). As the populations in developing countries age, it is imperative to develop responsive strategies to address the safety needs of the older adults. The information generated from this study can be used to design, pilot test and evaluate the effectiveness (including cost effectiveness) of injury prevention interventions using complex designs. The results can also inform an intensive multi-sectoral injury prevention strategy in the face of the growing numbers of older people in developing countries. Lessons learnt from other countries such as Australia, Great Britain, the Netherlands, New Zealand, Sweden and the United States that have successfully reduced road traffic injuries, are critical for LMICs (Marquez & Bliss, 2010). It needs to be explored whether the systematic road safety management systems that they put in place over about 40 years can be adapted to LMICs contexts (Marquez & Bliss, 2010). It would be necessary to get ongoing political support and resources for focused strategies, targeted action plans and delivery mechanisms in partnership with key stakeholders (Bliss & Breen, 2009).

STUDY LIMITATIONS

The questionnaire was administered through face-to-face interviews, and given the possible sensitivity of some of the questions, may have resulted in some under-reporting of injuries resulting from interpersonal violence. Cross-sectional data was used and therefore temporality could not be established. The analysis involved the limited number of risk factors measured in SAGE. Lastly, the survey collected information on the 'most recent injury' only. This may undermine the true burden of injuries especially if a large number of other injuries collectively cause a greater burden or have different aetiologies, consequences or associations. It is also worth noting that sufficient information may not have been obtained as some of the concepts, such as sleep patterns, were only explored using a single item.

CONCLUSION

This study provided population-based estimates and identified risk factors of non-fatal road traffic injury and other bodily injury (except for falls) among elderly people across

six countries. The burden of road traffic accidents varied among study countries and the risk factors included risky alcohol use, depression treatment, sleeping problems and rural residence. The findings of this study will assist policy makers, programme developers and public health researchers in developing evidence-based injury prevention interventions in order to reduce preventable injuries among older adults. Such interventions should be targeted at multiple levels, i.e. individual, interpersonal and community, and should focus on identified risk factors.

Policies and programmes pertaining to transport, housing, environment, welfare, urban/rural development and others should consider the needs and limitations of elderly with injuries.

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CONTRIBUTORS

SC, PK, KP, NP-M, and RB designed the research protocol and supervised its implementation. KP, JSW, PK and SC conceptualised the article. All of the authors reviewed drafts of the article and contributed to the final version thereof.

DECLARATION OF CONFLICTING INTERESTS

None declared

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