Physical injury and depression in six low- and middle-income countries: a nationally representative study

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1. Introduction

Major depressive disorder accounted for 8.2% of years lived with disability in the world in 2010 (Ferrari et al., 2013), and this psychiatric condition is responsible for an important share of the total burden attributable to non-communicable diseases (Patel, 2007). Furthermore, depression is positively associated with low quality of life (Zeng et al., 2013), chronic diseases (Kilzieh et al., 2008), and mortality (Kozela et al., 2016). Depression is now a major problem in low- and middle-income countries (LMICs), as these countries bear more than 80% of the global years lost to disability due to depression (World Health Organization, 2017), while the majority of people with depression in LMICs do not receive appropriate treatment (Cuijpers et al., 2018). Therefore, there is an urgent need to better understand the risk factors for depression in LMICs to establish effective prevention measures for this disorder.

Numerous factors that can increase the risk for depression have been identified in LMICs. These factors include female gender (Tomlinson et al., 2009), age (Geldsetzer et al., 2018), low socioeconomic status (Fernández-Niño et al., 2014), lack of social support (Cheng et al., 2014), low self-esteem (Azizi et al., 2013), stressful life events (Tao et al., 2011), family history of psychiatric disorders (Chin et al., 2016), and chronic conditions (Das et al., 2013; Wong et al., 2013). However, physical injuries (e.g., traffic accident, fall, gunshot, burns) have rarely been investigated as a risk factor for depression in LMICs despite growing scientific evidence from high-income countries showing that depression is highly prevalent among people who have experienced injuries (O'Donnell et al., 2004; Mitchell et al.,

2008; Wiseman et al., 2015; Rayner et al., 2016; Agtarap et al., 2017; Ahl et al., 2017; Martin et al., 2017).

Investigating the physical injury-depression relationship in LMICs is of particular importance because the incidence of injuries is disproportionately high in this setting (Kalaiselvana et al., 2011; Bashah et al., 2015), with 90% of the global physical injury-related deaths and 94% of disability-adjusted life years resulting from injuries occurring in these countries (Hyder, 2013). In addition, physical injury is associated with major costs at the individual and national level in this setting (Arokiasamy and Krishnan, 1994). For example, the economic burden of motorcycle accidents was estimated to be approximately US$ 1.2 million in Northern Ghana in 2008 (Kudebong et al., 2011). The high prevalence of physical injury in LMICs may be explained by factors such as insufficient law enforcement for the use of helmets or seat belts when driving (Routley et al., 2007; Wadhwaniya et al., 2017). In addition, there has been a rapid increase in the number of registered vehicles (Solanki et al., 2016), while traffic laws have remained relatively inadequate (Gopalakrishnan, 2012). Furthermore, some LMICs have very high rates of alcohol consumption (e.g., Eastern Europe) and this may be an important contributor to traffic injuries and other types of injury (e.g., falls, physical violence) (De Boni et al., 2011; Razvodovsky, 2012). Finally, it has been suggested that injuries may increase risk for depression via pain (Geerlings et al., 2002; Rivara et al., 2008; Stubbs et al., 2017b), impairments and disabilities in activities of daily living (Turner and Noh, 1988; Anke et al., 1997), stress (Wiseman et al., 2015; Yang et al., 2015), and job loss (Doctor et al., 2005; Andreeva et al., 2015). Thus, the impact of injuries on depression in LMICs may differ from that of high-income countries for factors such as differences in types

of injury, suboptimal treatment for injury/disability, lack of disability pensions, and high out-of-pocket costs associated with treatment which may lead to catastrophic expenditures (Wesson et al., 2014).

Although several studies have investigated the association between physical injury (or some conditions which may be attributable to injury such as fractures) and depression in LMICs (Rasmussen et al., 2007; Ukpong et al., 2007; Hawamdeh et al., 2008; de Moraes et al., 2010; Husain et al., 2010; Eldin et al., 2012; Dogu et al., 2014; Gandjalikhan-Nassab et al., 2016; Asuquo et al., 2017; Braimah et al., 2017; Chen et al., 2017; Wu et al., 2017), many of them were of small sample size (i.e., <200 participants) (Rasmussen et al., 2007; Ukpong et al., 2007; Hawamdeh et al., 2008; de Moraes et al., 2010; Eldin et al., 2012; Dogu et al., 2014; Gandjalikhan-Nassab et al., 2016; Asuquo et al., 2017; Braimah et al., 2017), conducted in either a single hospital or a limited area of a single country (Ukpong et al., 2007; Hawamdeh et al., 2008; de Moraes et al., 2010; Husain et al., 2010; Eldin et al., 2012; Dogu et al., 2014; Gandjalikhan-Nassab et al., 2016; Asuquo et al., 2017; Braimah et al., 2017; Wu et al., 2017), or lacked a control group (Rasmussen et al., 2007; Ukpong et al., 2007; Hawamdeh et al., 2008; Husain et al., 2010; Eldin et al., 2012; Dogu et al., 2014; Braimah et al., 2017; Wu et al., 2017). In addition, the few studies which did conduct an adjusted analysis failed to adjust for alcohol consumption despite the fact that alcohol consumption is known to strongly influence the likelihood of experiencing injury and also depression (Watt et al., 2004; Jorge et al., 2005). Finally, there is a lack of data on the differences in terms of risk for depression between physical injury with and without disability, despite the fact that previous

research has highlighted the major impact of disability on this psychiatric condition (Barry et al., 2013; Noh et al., 2016).

Therefore, the goal of the present study was to investigate the relationship between physical injury (with and without disability) and depression in six LMICs (China, Ghana, India, Mexico, Russia, South Africa) using nationally representative data of the Study on Global Ageing and Adult Health (SAGE). These countries broadly represent different geographical locations and levels of socio-economic and demographic transition.

2. Methods

2.1. The survey

Data from the Study on Global Ageing and Adult Health (SAGE) survey were analyzed. This dataset is publically available through the World Health Organization (WHO) website (http://www.who.int/healthinfo/sage/en/). The survey was undertaken in China, Ghana, India, Mexico, Russia, and South Africa between 2007 and 2010. Based on the World Bank classification at the time of the survey, Ghana was the only low-income country, and China and India were lower middle-income countries although China became an upper middle-income country in 2010. The remaining countries were upper middle-income countries. This classification is based on the gross national income (GNI) per capita (in US dollars), converted from local currency using the World Bank Atlas method. For example, the specific figures for year 2010 were: low income (≤$1005), lower middle income ($1006-$3975) and upper middle income ($3976-$12275).

Details of the survey methodology have been published elsewhere (Kowal et al., 2012). In brief, in order to obtain nationally representative samples, a multistage clustered sampling design method was used. The sample consisted of adults aged ≥18 years with oversampling of those aged ≥50 years. Following a common research protocol across countries, trained interviewers conducted face-to-face interviews using a standard questionnaire to collect information. The questionnaires were translated from English into the local languages, following the WHO translation guidelines. All interviews in Mexico were completed using a computer-assisted personal interview (CAPI), while a paper and pencil interview (PAPI) was used in the remaining countries with the exception of China where both CAPI and PAPI were used. The response rate for each country was: 93% (China); 81% (Ghana); 68% (India); 53% (Mexico); 83% (Russia); 75% (South Africa). Sampling weights were constructed to adjust for the population structure as reported by the United Nations Statistical Division. Ethical approval was obtained from the WHO Ethical Review Committee and local ethics research review boards. Written informed consent was obtained from all participants.

2.2. Variables

2.2.1. Depression

Questions based on the World Mental Health Survey version of the Composite International Diagnostic Interview (Kessler and Ustün, 2004) were used for the endorsement of past 12-month DSM-IV depression with the same algorithm as in previous studies using the same dataset (**eTable 1** of the supplementary material) (Koyanagi et al., 2014; Garin et al., 2016).

2.2.2. Physical injury

Physical injury was assessed with two main questions with yes/no answer options: “In the last 12 months, have you been involved in a road traffic accident where you suffered from bodily injury?” (traffic accident injury); and “In the last 12 months, have you had any other event where you suffered from bodily injury?” (other injury). For both questions, for those who responded affirmatively, follow-up questions were asked: (1) “How did the injury happen?” [answer options “it was an accident (unintentional)”, “someone else did it to me deliberately (intentional)”, “I did it to myself deliberately (self-inflicted)”]; (2) “Did you suffer a physical disability as a result of being injured?” (yes/no answer options). Any injury in our analysis referred to having experienced either or both traffic injury or other injury in the past 12 months. Variables on any injury, traffic accident injury, and other injury were used as dichotomous (yes or no) or three-category variables (no accident, accident without disability, accident with disability) in our analysis. Traffic injuries were distinguished from other types of injury in some analyses because they are associated with a major burden in LMICs (Dalal et al., 2013), and their public health implication (e.g., preventive strategies) may differ from other forms of injury. For those who suffered a physical disability, a follow-up question asked in which ways they were physically disabled. Information on the cause of “other injury” was also obtained. If there were multiple injuries, the participant was asked to refer to the most recent incident.

2.2.3. Control variables

The control variables were selected based on past literature (Clausen et al., 2015) and included sex, age, wealth (poorest, poorer, middle, richer, richest), highest level of education achieved (≤primary, secondary, ≥ tertiary), setting (rural or urban), and

alcohol consumption (never, non-heavy, heavy). Wealth reflected capital at the individual level, whereas country income reflected capital at the national level. Wealth quintiles were derived from the household ownership of durable goods (e.g., chairs, television, access to electricity). Using a Bayesian post-estimation method, households were arranged in increasing order of assets. The raw continuous income estimates were classified into country-wise quintiles using the asset order. Alcohol consumption was assessed by the question "Have you ever consumed a drink that contains alcohol (such as beer, wine, spirits, etc)?" Those who answered "no" were categorized as "never" drinkers. For those answering "yes", a separate question asked about how many drinks of any alcohol beverage they had consumed on each day of the past week. Consumers of at least 4 (females) or 5 drinks (males) of any alcoholic beverage per day on at least one day in the past week were considered "heavy" drinkers. Those who had ever consumed alcohol but were not heavy drinkers were categorized as "non-heavy" drinkers (Koyanagi et al., 2015).

2.3. Statistical analysis

The statistical analysis was performed with Stata 14.1 (Stata Corp LP, College station, Texas). We conducted multivariable logistic regression analysis to assess the association between the three-category physical injury variable (exposure; i.e., no injury, injury without disability, injury with disability) and depression (outcome) using the overall sample. As a sensitivity analysis, we also assessed whether the results remain similar after the omission of those who had a self-inflicted physical injury as self-inflicted injury may have a different effect on mental health.

Country-wise analysis was also conducted with the dichotomous any injury variable (yes/no) as the exposure variable. We did not use the three-category variable for this

part of the analysis due to the limited sample size in each country. In order to assess the between-country heterogeneity that may exist in the association between injury and depression, we calculated the Higgin's I^2 based on estimates for each country. The Higgin's I^2 represents the degree of heterogeneity that is not explained by sampling error with a value of 25% often considered as low, 50% as moderate, and 75% as high heterogeneity (Higgins et al., 2003). In line with previous studies using multi-country data (Prince et al., 2012; Koyanagi et al., 2016; Stubbs et al., 2017a; DeVylder et al., 2018), a pooled estimate was obtained by random-effect meta-analysis based on country-wise estimates using the Stata *metan* command.

All models were adjusted for sex, age, wealth, education, setting, and alcohol consumption. The model using the overall sample was additionally adjusted for country by including dummy variables for each country (Koyanagi et al., 2014). All variables were included in the models as categorical variables with the exception of age. The sample weighting and the complex study design were taken into account in all analyses with the use of the Taylor linearization method. Results from the logistic regression models are presented as odds ratios (OR) with 95% confidence intervals (CI). The level of statistical significance was set at $P<0.05$.

3. Results

The final sample included 42489 individuals aged ≥18 years (China n=14813; Ghana n=5110; India n=11230; Mexico n=2756; Russia n=4355; South Africa n=4225). The mean age (SD) of the sample was 43.8 (14.4) years and 50.1% were females (**Table 1**). The percentage of those who were ≥50 years was 27.3% (unweighted N=34,129), and the age range was 18-114 years. The overall prevalence of

depression was 4.1%. Overall, the prevalence of physical injuries with and without disability were, respectively, 1.4% and 6.5% for any injury, 0.4% and 2.0% for injuries due to road traffic accident, and 1.0% and 4.7% for injuries due to other cause. The most common causes of injury not related with traffic accidents were a fall (59.3%), struck/hit by a person or object (13.1%), and stabbed (7.4%) in the overall sample (**eTable 2** of the supplementary material). There was a wide variation in terms of the major causes of injury not related with traffic accidents between countries. The most common physical disabilities associated with an injury were difficulties using (or unable to use) hand or arm and walking with a limp (**eTable 3** of the supplementary material). The prevalence of male sex, lower levels of wealth and education, rural setting, and alcohol consumption was significantly higher among those who had any injury (**Table 1**). The sample characteristics by country are shown in **Table 2**. The prevalence of any injury was highest in India (10.7%), followed by Ghana (7.2%), and Mexico (6.4%), with the lowest prevalence being observed in South Africa (3.2%). The prevalence of disability due to any injury was highest in Mexico (3.1%) and India (2.4%).

The prevalence of depression was higher among those who had any injury in the overall sample and also country-wise samples (**Figure 1**). The results for the multivariable logistic regression analyses showed that compared to having no injury, any injury without disability (OR=1.72; 95%CI=1.18-2.50) and with disability (OR=3.81; 95%CI=2.16-6.73) were both associated with significantly higher odds for depression (**Table 3**). As for injuries due to road traffic accidents, injury without disability was not associated with depression. The deletion of those who had a self-inflicted injury had almost no influence in the results (data not shown). The country-wise association between any injury and depression is shown in **Figure 2**. In all

countries, any injury was associated with higher odds for depression (ORs ranging from 1.45 to 12.00) although the results were not significant in Ghana (OR=1.45; 95%CI=0.64-3.27) and Russia (OR=2.37; 95%CI=0.49-11.41). The overall pooled estimate based on a meta-analysis was 3.28 (95%CI=1.71-6.31) with a moderate level of between-country heterogeneity being observed (I^2=63.1%).

4. Discussion

4.1. Main findings

This study including more than 42000 adults from six LMICs showed that the prevalence of physical injury ranged from 3.2% in South Africa to 10.7% in India. The overall prevalence of depression in our study (4.1%) was comparable to previously reported rates of depression from 36 LMICs (6.6%) and 10 high-income countries (5.5%) (Bromet et al., 2011; Stubbs et al., 2016). Overall, physical injury without disability was associated with a 1.7 times higher odds for depression, whereas injury with disability was associated with a 3.8-fold increased odds. There was a moderate level of between-country heterogeneity, with particularly strong associations being observed in Mexico and South Africa.

4.2. Interpretation of the findings

To the best of our knowledge, this is the first nationally representative study investigating the association between physical injury (including associated disability) and depression in LMICs, although numerous studies of small sample size including patients with some form of physical trauma/injury from a single hospital have been published in recent years (Rasmussen et al., 2007; Ukpong et al., 2007; Hawamdeh

et al., 2008; de Moraes et al., 2010; Husain et al., 2010; Eldin et al., 2012; Dogu et al., 2014; Gandjalikhan-Nassab et al., 2016; Asuquo et al., 2017; Braimah et al., 2017; Chen et al., 2017; Wu et al., 2017). For example, one study from India on survivors of tortures found that chronic injuries were associated with major depression (Rasmussen et al., 2007). Another prospective study from Nigeria showed that 41.2% and 11.8% of patients with facial injury had anxiety and depression, respectively, in the weeks following the trauma (Ukpong et al., 2007). Next, one study found that 40% of injured workers in Egypt were affected by depression or anxiety, and these psychiatric disorders had a negative impact on the perceived health-related quality of life (Eldin et al., 2012). Finally, an Iranian case-control study found that the prevalence of depression was 14% in patients with facial trauma whereas this figure was only 4% in controls (Gandjalikhan-Nassab et al., 2016). Taking together, these results underline the possibility that physical injury may be an important risk factor for depression in LMICs.

Although the exact mechanism linking physical injury and depression is largely unknown, several hypotheses may be proposed. First, pain due to the physical injury may increase the risk for depression. For example, almost 63% of patients with major physical trauma reported injury-related pain 12 months after the injury (Rivara et al., 2008), while pain may induce depression via fatigue (Iversen and Wessely, 2003; Salvetti et al., 2013), sleep problems (Yokoyama et al., 2010; Tang et al., 2015) or functional limitations (Smith et al., 2016; He et al., 2019). In LMICs, pain can potentially be an important cause of depression as it is often poorly managed and access to analgesics is limited in some resource-poor settings (Morriss and Roques, 2018). Second, physical injury can also lead to impairments and disabilities

in activities of daily living (Anke et al., 1997), and physical disability in turn increases the risk for depression (Turner and Noh, 1988), possibly via social categorization and stereotyping, abuse, and loss of roles (e.g., at work or home) (Noh et al., 2016). In line with this hypothesis, we found in this study that the physical injury-depression relationship was much stronger in participants with a disability (OR=3.8) than in those without a disability (OR=1.7). It is possible that physical disabilities may have a particularly profound effect on mental wellbeing in LMICs as rehabilitation centers are often underdeveloped or limited in most LMICs (Xiao et al., 2017). Third, stress is a frequent reaction after experiencing physical trauma (Wiseman et al., 2015), and can trigger a depressive episode (Yang et al., 2015). The impact of physical injury on stress has been proposed to be mediated by re-experiencing of the trauma, nightmares and emotional distress when exposed to specific triggers (Wiseman et al., 2015). Another factor that can increase stress after a physical injury is out-of-pocket expenditure or catastrophic expenditure for health care (Leive and Xu, 2008; Vancampfort et al., 2017), which is common in many LMICs where the availability of health insurance is limited. Next, physical injury may also result in job loss due to disability (Doctor et al., 2005), and this can increase risk for subsequent major depression via factors such as poverty (Heflin and Iceland, 2009; Andreeva et al., 2015). Given that many jobs in LMICs are manual work (e.g., agricultural occupation) (Atkinson et al., 2016), people in LMICs may be at a particularly high risk of losing jobs and income as a result of disabilities. The lack of well-established social security schemes in many LMICs (e.g., disability pensions) may further complicate the situation. Finally, it is also possible that depression increases the risk for physical injuries via decreased vigilance, lack of attention, irritability, or insomnia (Peele and Tollerud, 2005; Kim et al., 2008; Patten et al., 2010).

Another interesting result of our study is that there was a moderate level of between-country heterogeneity in the association between physical injury and depression in the six LMICs. The physical injury-depression relationship was strongest in South Africa (OR=12.0) and weakest in Ghana (OR=1.5). This finding is of particular importance because it shows that some factors potentially buffering the impact of physical injury on depression are likely to be differentially distributed between these countries. Indeed, our data showed that the main types of injury vary substantially between countries, and it is possible that they have different effects on mental health. Apart from this, differences in levels of rehabilitation (Furlan et al., 2018), community reintegration (Sekaran et al., 2010) or psychological management (Yatham et al., 2017) between countries may also explain the between-country difference. Furthermore, country differences may also be related to how symptoms of depression are understood, expressed and reported. For example, depression is often expressed as a somatic symptom in Asian cultures (Ryder et al., 2008). Finally, the weak association between physical injury and depression in Ghana, the only low-income country included in this study, suggests that non-economic factors (e.g., resilience, hope, familial environment) may play a role in this relationship.

In our analysis, alcohol consumption was not significantly associated with depression, and thus, this factor is unlikely to have influenced the association between injury and depression. However, this may have been due to the different timeframe used for the assessment of alcohol consumption in comparison with depression and injury. Given that previous studies have found positive associations between alcohol consumption and depression or injury (Paljärvi et al., 2009; Clausen

et al., 2016), future studies should further assess the role of alcohol consumption in the association between injury and depression.

4.3. Clinical and policy implications and areas for future research

The results of our study indicate that victims of physical injury should be screened for depression in the months and years following the trauma. Clinicians should be aware that those who become disabled as the result of an injury are at especially high risk for depression. Close collaboration between health professionals involved in the management of physical injuries such as orthopedic surgeons, specialists of physical medicine and rehabilitation, or physiotherapists and mental health care workers (e.g., psychiatrists, psychologists, social workers) may be essential to improve clinical outcomes when depression is detected in patients with an injury. However, many resource-limited settings lack specialists in these fields and adequate treatment for injuries and mental health problems is often not available, while rehabilitation facilities for disabilities are also limited. This may pose a significant challenge in addressing the injury-depression comorbidity in some LMICs. Previous studies from LMICs have shown that the use of lay community health workers may be key to improve mental wellbeing in people living in resource-limited settings (Ali et al., 2003; Baker-Henningham et al., 2005; Cooper et al., 2009; Tripathy et al., 2010; Niemi et al., 2016). Thus, it is possible that community health workers may be able to address depression or reduce risk for depression of physically injured people by interpersonal psychotherapy, peer support or health information (Yatham et al., 2017).

Next, it is also theoretically possible that pain treatment, adequate rehabilitation for disability, and stress management may reduce risk for future onset of depression in people who experienced an injury. Given that little is known about the effect of these potential interventions on depression in injured individuals, investigating these issues may provide insight on how to prevent depression among trauma patients. Finally, in terms of policy implications, some LMICs lack the basic infrastructure or law enforcement to prevent injuries and this may be particularly important in areas where the consequences of injuries may be particularly severe in terms of disabilities and economic consequences due to factors such as inadequate treatment, loss of jobs, and lack of social security schemes. For example, enforcing laws on speeding, alcohol consumption, and motorcycle helmets are essential to prevent traffic injuries, and in the case of fall-related injuries, tall buildings should be equipped with window guards, and standards should be clearly defined for playground equipments (World Health Organization, 2014).

4.4. Strengths and limitations

The use of nationally representative data and the large sample size are the two main strengths of this study. However, our findings should be interpreted in light of several limitations. First, the survey data were based on self-report, and may have been subject to some level of bias (e.g., recall bias, social desirability bias). Second, questions on injury lacked details on the exact circumstance, severity, and requirement for hospital admission which could have provided a better understanding of the association between injury and depression. Third, although some authors have suggested that depression and other psychiatric conditions may be better viewed as a continuous construct (Markon et al., 2011; Haslam et al., 2012;

Chen et al., 2017), we were unable to analyze depression as a continuous measure. Fourth, institutionalized and homeless individuals were not included in this study. Thus, the results are not generalizable to these populations which may have a high prevalence of injury and/or depression. Fifth, the results of our study were derived only from six LMICs and therefore, our results are not representative of all LMICs. Next, the response rate for the SAGE survey was comparable to or higher than that of other national surveys on ageing in most of the countries included in our study. Nevertheless, there was some between-country variability and the response rate for Mexico was low. The low response rate of Mexico was partly attributable to the short time for field work where multiple visits were not possible if the respondent was not available at the initial visit. Thus, it is possible that some level of bias may exist due to non-response. However, the use of sampling weights to adjust for the population structure is likely to have partially mitigated the potential bias. Furthermore, other epidemiological studies have found that poor response rates have a minimal effect on the risk estimates and in the identification of risk factors of psychiatric disorders (Batty and Gale, 2009; Bergman et al., 2010). Finally, it was not possible to investigate causality or temporality of the physical injury-depression relationship because of the cross-sectional design.

4.5. Conclusion

This nationally representative study found that physical injury is associated with an increased odds for depression and that this association is particularly pronounced in those who became disabled as the result of an injury in six LMICs. Clinicians should be aware of this comorbidity, and future studies should investigate the factors that underlie this comorbidity to improve clinical outcomes, and to prevent depression

onset among those who experienced an injury. Furthermore, enforcement of policies at the country-level to reduce injuries may also improve mental wellbeing among people living in LMICs.

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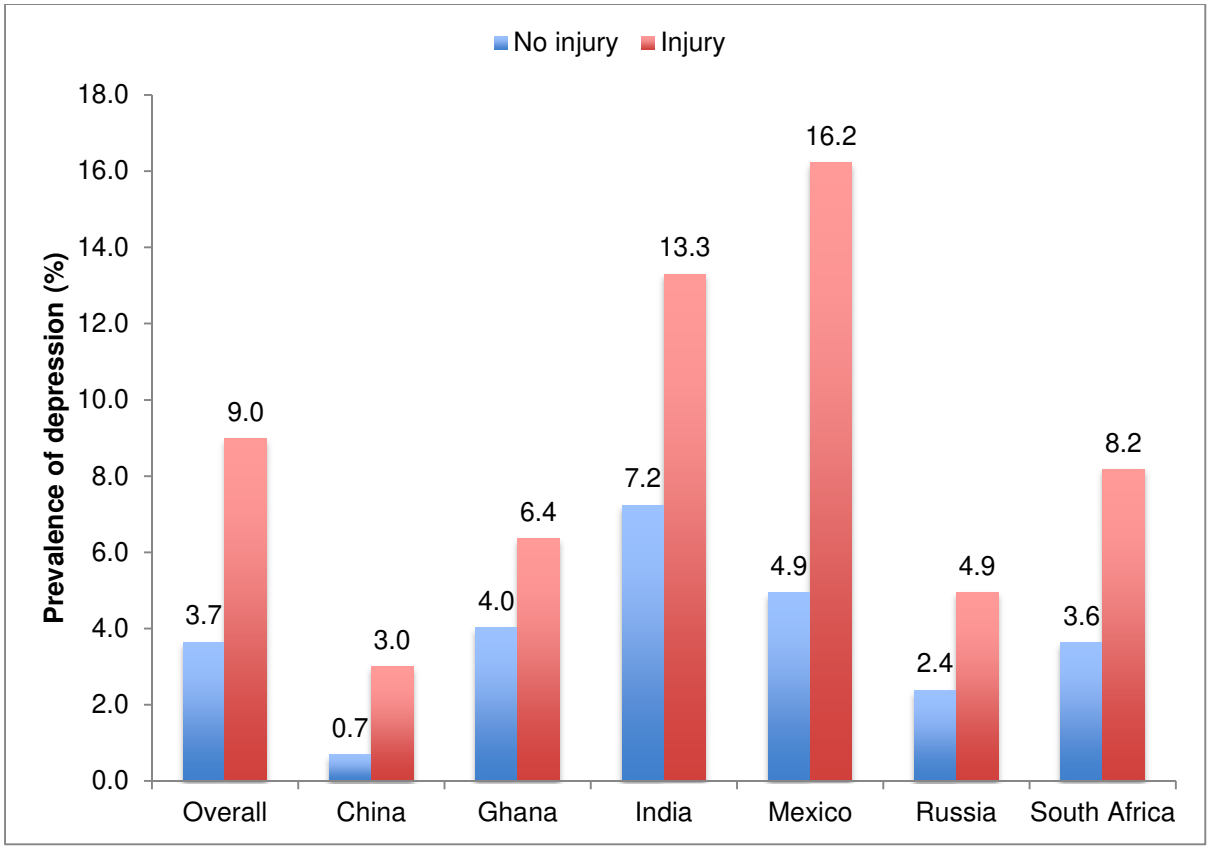

Figure 1 Prevalence of depression among those with and without any injury in the past 12 months

Data are based on weighted prevalence.

Any injury included both road traffic accidents and bodily injury for other causes.

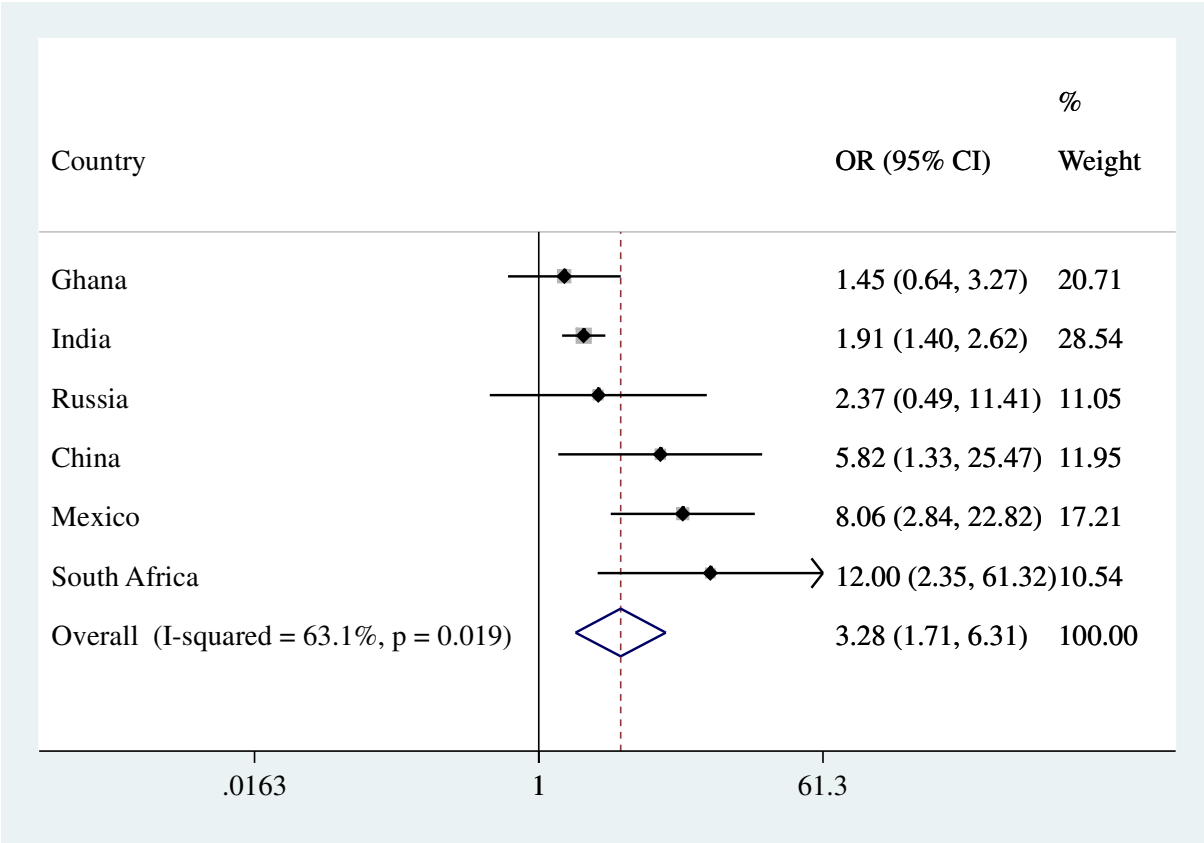

Figure 2 Country-wise association between any injury (exposure) and depression (outcome) in the past 12 months estimated with multivariable logistic regression

Abbreviation: OR Odds ratio; CI Confidence interval.

Models are adjusted for sex, age, wealth, education, setting, and alcohol consumption.

Any injury included both road traffic accidents and bodily injury for other causes.

The overall estimate was calculated by random-effects meta-analysis.

Table 1 Sample characteristics (overall and by presence of any injury)

Characteristic	Category	Overall	Any injury[a] No	Yes	P-value[b]
Sex	Female	50.1	50.8	42.5	<0.001
	Male	49.9	49.2	57.5	
Age	Mean (SD)	43.8 (14.4)	43.8 (14.4)	43.5 (13.8)	0.512
Wealth	Poorest	14.9	14.6	19.5	<0.001
	Poorer	17.8	17.7	19.7	
	Middle	18.8	18.5	22.5	
	Richer	21.1	21.3	19.7	
	Richest	27.3	28.0	18.8	
Education	≤Primary	43.0	42.2	52.4	<0.001
	Secondary	46.6	47.1	39.9	
	≥Tertiary	10.4	10.6	7.7	
Setting	Rural	55.8	54.9	66.3	<0.001
	Urban	44.2	45.1	33.7	
Alcohol consumption	Never	68.3	68.7	63.4	0.007
	Non-heavy	26.4	26.2	27.9	
	Heavy	5.3	5.0	8.7	

Abbreviation: SD Standard deviation
Data are % unless otherwise stated.
Data are based on weighted estimates.
[a] Any injury included road traffic accidents and bodily injury for other causes occurring in the past 12 months.
[b] P-value was obtained by Chi-squared test and Student's *t*-test for categorical and continuous variables, respectively.

Table 2 Sample characteristics by country

Characteristic	Category	China	Ghana	India	Mexico	Russia	South Africa
Sex	Female	49.13	49.99	49.12	52.00	55.01	52.77
	Male	50.87	50.01	50.88	48.00	44.99	47.23
Age	Mean (SD)	45.6 (12.8)	44.4 (14.3)	41.1 (14.7)	42.7 (14.7)	47.3 (16.9)	41.8 (14.8)
Education	≤Primary	37.53	63.44	61.35	51.69	3.22	37.55
	Secondary	53.15	32.04	30.28	35.85	75.56	54.45
	≥Tertiary	9.32	4.52	8.38	12.46	21.21	8.00
Setting	Rural	51.52	54.23	74.52	22.24	18.46	30.66
	Urban	48.48	45.77	25.48	77.76	81.54	69.34
Alcohol consumption	Never	66.51	44.76	84.03	45.38	19.17	76.52
	Non-heavy	24.89	52.53	15.31	45.56	70.82	15.36
	Heavy	8.61	2.72	0.67	9.06	10.01	8.12
Depression	Presence	0.83	4.19	7.89	5.66	2.54	3.77
Injury	Any injury	6.06	7.22	10.73	6.38	6.14	3.18
	Traffic accident	1.97	1.30	2.93	3.74	2.42	2.42
Injury with disability	Any injury	0.83	1.09	2.42	3.14	0.06	0.84
	Traffic accident	0.26	0.10	0.58	1.66	0.03	0.71

Abbreviation: SD Standard deviation
Data are % unless otherwise stated.
Data are based on weighted estimates.

Table 3 Association of any injury, injury due to traffic accident, and injury due to other causes with depression estimated by multivariable logistic regression

Characteristic	Category	Any injury		Injury due to traffic accident		Injury due to other causes	
		OR	95%CI	OR	95%CI	OR	95%CI
Injury	No injury	1.00		1.00		1.00	
	Injury without disability	1.72**	[1.18,2.50]	0.65	[0.35,1.22]	2.05**	[1.33,3.14]
	Injury with disability	3.81***	[2.16,6.73]	6.12*	[1.42,26.40]	3.20***	[2.02,5.05]
Sex	Female	1.00		1.00		1.00	
	Male	0.67**	[0.51,0.87]	0.67**	[0.52,0.86]	0.67**	[0.52,0.87]
Age (years)	Per one year increase	1.03***	[1.02,1.03]	1.03***	[1.02,1.03]	1.03***	[1.02,1.03]
Wealth	Poorest	1.00		1.00		1.00	
	Poorer	0.91	[0.68,1.22]	0.91	[0.68,1.22]	0.91	[0.68,1.22]
	Middle	0.75	[0.54,1.06]	0.75	[0.54,1.05]	0.76	[0.54,1.06]
	Richer	0.54***	[0.39,0.75]	0.53***	[0.38,0.74]	0.54***	[0.39,0.75]
	Richest	0.53**	[0.35,0.78]	0.52**	[0.35,0.77]	0.52**	[0.35,0.78]
Education	≤Primary	1.00		1.00		1.00	
	Secondary	1.10	[0.80,1.51]	1.09	[0.79,1.49]	1.10	[0.80,1.51]
	≥Tertiary	0.80	[0.41,1.58]	0.79	[0.40,1.56]	0.80	[0.40,1.57]
Setting	Rural	1.00		1.00		1.00	
	Urban	1.22	[0.90,1.64]	1.20	[0.89,1.62]	1.21	[0.89,1.63]
Alcohol consumption	Never	1.00	[1.00,1.00]	1.00	[1.00,1.00]	1.00	[1.00,1.00]
	Non-heavy	0.87	[0.60,1.26]	0.88	[0.61,1.28]	0.87	[0.60,1.26]
	Heavy	0.72	[0.27,1.89]	0.75	[0.28,1.96]	0.70	[0.26,1.84]

Abbreviation: OR Odds ratio; CI Confidence interval.
Models are adjusted for all variables in the Table and country.
* $p<0.05$, ** $p<0.01$, *** $p<0.001$.