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Fall injuries in Baghdad from 2003 to 2014: Results of a randomised household cluster survey

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ABSTRACT

Introduction: Falls incur nearly 35 million disability-adjusted life-years annually; 75% of which occur in low- and middle-income countries. The epidemiology of civilian injuries during conflict is relatively unknown, yet important for planning prevention initiatives, health policy and humanitarian assistance. This study aimed to determine the death and disability and household consequences of fall injuries in post-invasion Baghdad.

Methods: A two-stage, cluster randomised, community-based household survey was performed in May of 2014 to determine the civilian burden of injury from 2003 to 2014 in Baghdad. In addition to questions about household member death, households were interviewed regarding injury specifics, healthcare required, disability, relatedness to conflict and resultant financial hardship.

Results: Nine hundred households totaling 5148 individuals were interviewed. There were 138 fall injuries (25% of all injuries reported); fall was the most common mechanism of civilian injury in Baghdad. The rate of serious fall injuries increased from 78 to 466 per 100,000 persons in 2003 and 2013, respectively. Fall was the most common mechanism among the injured elderly (*i.e.* ≥65 years; 15/24 elderly unintentional injuries; 63%). However, 46 fall injuries were children aged <15 years (49% of unintentional injuries) and 77 were respondents aged 15–64 years (36%). Respondents who spent significant time within the home (*i.e.* unemployed, retired, homemaker) had three times greater odds of having suffered a fall injury than student referents (aOR 3.34; 95%CI 1.30–8.60). Almost 80% of fall injured were left with life-limiting disability. Affected households often borrowed substantial sums of money (34 households; 30% of affected households) and/or suffered food insecurity after a family member's fall (52; 46%).

Conclusion: Falls were the most common cause of civilian injury in Baghdad. In part due to the effect of prolonged insecurity on a fragile health system, many injuries resulted in life-limiting disabilities. In turn, households shouldered much of the burden after fall injury due to loss of income and/or medical expenditure, often resulting in food insecurity. Given ongoing conflict, civilian injury control initiatives, trauma care strengthening efforts and support for households of the injured is urgently needed.

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Introduction

Injuries account for 11% of the global disease burden [1]. Falls are the second leading cause of unintentional injury worldwide and are increasing in frequency given aging populations [2]. This burden rests disproportionately on low- and middle-income countries (LMICs), which harbor 75% of the 34 million disability-adjusted life years incurred annually from fall injuries [3].

Iraq is a middle-income country that has been plagued by decades of conflict. In addition to acts of violence, insecurity has disrupted injury prevention strategies, safe infrastructure, maintenance of a culture of safety, and the fragile health system [4,5]. Because of this, risk of injury and subsequent death or disability is high in Iraq [4,6–9]. In 2010, injury incurred more than 4100 disability-adjusted life-years (DALYs) per 100,000 persons in Iraq. For comparison, the rate of DALYs incurred from injury in Lebanon, a Middle Eastern country with an equivalent gross domestic product per capita, was 2441 [10,11]. Intentional injuries and fatalities related directly to conflict (*e.g.* gun shots, bomb blasts) may represent only a fraction of the total injury burden during conflict, particularly among civilians [4]. Therefore, estimating the burden of civilian intentional and unintentional injuries may provide a more accurate assessment of the effect of conflict on a population in crisis than focusing on conflict-related injuries alone [4,6,7,12].

A cross-sectional household cluster survey performed in Baghdad in 2009 reported that the injury incidence was 58 per 1000 persons (worldwide rate of injuries is 0.61 per 1000 persons) [4,13]. Falls were the most common injury reported in Iraq in all age groups (30% of all injuries) and were more common than road traffic injuries (9% of all injuries), gunshots (6%), stabbings (2%) and explosions (7%) combined. This unusual epidemiology highlights the importance of understanding direct and indirect civilian injury burden during wartime prior to adopting under-informed injury prevention or health system strengthening interventions [5].

To address the lack of data on civilian traumatic death and disability in Baghdad post-invasion, a two-stage cluster randomised, community-based survey on injuries that occurred from 2003 to 2014 was performed in May of 2014. This report details the death and disability, healthcare received and household consequences from fall injuries. By doing so, better estimates of the cumulative effect of insecurity on civilian injuries could be determined. Such estimates might better inform injury control initiatives, health policy and humanitarian relief planning.

Methods

Study design

A team of international and Iraqi public health and trauma experts with experience from previous two-stage cluster study designs in Iraq, Rwanda and Sierra Leone developed the survey strategy [7,14,15]. A survey instrument was adapted from the World Health Organization's community injury survey guidelines and the Surgeons OverSeas Assessment of Surgical Need (SOSAS) [14–16]. The instrument was translated into Arabic, back translated to assure accuracy and piloted for utility and validity. The final version was designated the Surgeons OverSeas Injury Survey (SOSINJ).

A two-stage randomised 30 cluster by 30 households sample was performed. Baghdad was divided into 14 administrative districts and sectors and 30 random clusters were chosen using Google Earth™. Clusters were delineated based on the 2011 population estimates for administrative units in Baghdad. Data were obtained from the Iraqi Central Organization for Statistics and Information Technology and Ministry of Health [17]. Five clusters were randomly replaced due to security concerns or being located proximate sensitive military facilities a priori.

Data collection

The starting household and a backup-starting household were selected using satellite imagery and grids in Google Earth™ [18]. If teams deemed the starting household unsafe they proceeded to the backup-starting household. After the starting household, every other household was interviewed until 30 households were completed. A household was defined as a group of persons living together in a dwelling with a separate outer door and a separate kitchen. Most clusters had no household refusal. However, five clusters had a single refusal each.

Two teams of four trained Iraqi physicians worked with a supervisor and sampled households in May of 2014. Heads of household were identified and explained the survey procedure. After obtaining verbal informed consent, heads of the household were interviewed with regard to household demographics. Questions on injuries, mechanism, relation to conflict, care required, disabilities (*e.g.* ability to care for self, climb stairs, walk or suffering of pain, stigma or anxiety/depression), financial hardship, suspected responsible party for intentional injuries and others were asked. Subsequently, all household members were interviewed if present. The head of household provided information about injuries and disabilities for household members who were unable to answer questions (*e.g.* children, head injured) or not present.

Data management and analysis

Data were collected on paper forms and doubly entered into a database. Discrepancies were immediately clarified with collection teams. Age was divided into three categories: $\leq$14, 15–64, and $\geq$65 years. The 15 years of age cut-off was defined by the minimum working age in Iraq [19]. Over age 65 years, the risk of fall injury increases dramatically; thus, this age cut-off is used by the World Health Organization for age risk-stratification for fall injuries [2]. We described the relationships between demographic factors and fall injuries. A non-parametric test for trend of the number of serious fall injuries per year was also calculated.

Bivariate logistic regression was used to model the effect of each covariate on having suffered a fall injury after 2002. After, a three-level mixed-effects logit link function was built in a bidirectional stepwise fashion. Age was included in the model given its known association with falling [2]. Education level, occupation and fall location were included in the model given their evidence for strong association with fall injury from the bivariate analysis. None of the covariates demonstrated multicollinearity (mean variance inflation factor 1.13; condition number 11.6) and no influential outliers were identified. Akaike's information criteria (AIC) were used to measure the relative quality of each model. The use of age as a categorical covariate resulted in better model fit than when it was included as a continuous covariate. The model with the lowest AIC did not include sex, education level or work-related injury. Covariates for cluster and household were included to control for intra-class correlation. The final model equation was:

Using national census data from 1997, 2003 and 2011 performed by the Iraqi Central Organization for Statistics and Information Technology, incidence rates were calculated [17]. For years between censuses, the population of Baghdad was estimated using second-degree parabolic extrapolation [20]. All analyses were performed using Stata v13 (College Station, TX, USA).

To minimise reporting recall biased results, incidence rates were calculated using only serious injuries. Serious injuries were

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