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ORIGINAL ARTICLE

Fatal and hospitalised childhood injuries in Fiji (TRIP Project-3)

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Aim: Although childhood injury rates in low- and middle-income countries are known to be high, contemporary data on this topic from Pacific Island countries and territories are scant. We describe the epidemiology of childhood injuries resulting in death or hospital admission in Fiji using a population-based registry.

Methods: A cross-sectional analysis of the Fiji Injury Surveillance in Hospitals system investigated the characteristics associated with childhood injuries (<15 years) in Viti Levu, resulting in death or hospital admission (≥12 h) from October 2005 to September 2006.

Results: The 496 children meeting the study eligibility criteria corresponded to annual injury-related hospitalisation and death rates of 265.4 and 15.3 per 100 000, respectively. Most (82%) deaths occurred prior to hospitalisation. The death and hospitalisation rates were highest among the <5- and 5- to 9-year groups, respectively. Males and indigenous Fijian children were at increased risk of injury. The leading causes of injury death were road traffic injury (29%), choking (25%) and drowning (18%). Major causes of hospital admission were falls (48%), burns (13%), road traffic injury (11%) and being hit by a person or object (10%). Fractures and head injuries were the most common types of injury.

Conclusion: The findings support the need for a national strategy that builds capacity and mobilises resources to prevent childhood injuries in Fiji. Priority actions should include investment in technical support and research to identify local contextual and social determinants that inform the development and implementation of effective injury prevention interventions as a child health survival strategy.

Key words: child; Fiji; injury; Pacific Island; surveillance.

What is already known on this topic

1 The burden of childhood injuries in low- and middle-income countries is recognised to be high.
2 Injuries among children in Pacific Island countries have received scant research attention, limiting opportunities to develop prevention strategies.
3 Reliable information about the causes and consequences of child injury is necessary to identify gaps in existing public health policy and to promote action to reduce the burden of injury.

What this paper adds

1 The leading causes of injury resulting in admission to hospital for children living in Fiji are falls, fire/heat/scalds/electrical burns, road traffic injury and being hit by a person or object.
2 The leading causes of death for children living in Fiji are road traffic injury, choking and drowning. Most (82%) injury deaths occur out of hospital.
3 There is a major need for data on the contexts of these injuries to inform national child injury prevention strategies.

On 24 May 2011, the 64th World Health Assembly passed a historic resolution calling on all member states to prioritise the prevention of child injuries.[1] The first such resolution on this topic, the call to action, is based on the fact that over 830 000 children world-wide die from injuries, and millions more are disabled.[2,3] Deaths due to injuries before the age of 15 years are five times more common in developing countries than in developed countries,[4] with 95% of all child injury deaths globally occurring in low- and middle-income countries (LMICs).[2] The annual mortality rate of childhood unintentional injuries in LMICs in the Western Pacific Region is more than four times greater than the rate of high-income countries in the same region (33.8 vs. 7.8 per 100 000 children).[2]

In order to redress these inequities in the distribution of injuries, greater attention is required to public health prevention efforts, nationally and regionally.[3] Reliable information about the causes and consequences of injuries can serve as a powerful stimulus to identify gaps in existing public health policy and to promote action to reduce the burden of injury.[2]

In this regard, there are notable challenges in many Pacific Island countries and territories, particularly including Fiji. The sparse research data on the characteristics of childhood injuries

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at a population level limit the opportunity to develop comprehensive national injury prevention and control strategies. The implications of childhood injuries for these small, economically vulnerable nations are, however, likely to be no less important than the estimated burden in LMICs with large populations that are at the forefront of current global initiatives.

The Fiji Injury Surveillance in Hospitals (FISH) system was a prospective population-based surveillance registry established at all trauma-admitting hospitals in Viti Levu. The FISH system was piloted and refinements made prior to commencing the 12-month surveillance period.[5] The FISH initiative was a component of the Traffic Related Injuries in the Pacific (TRIP) project, funded by The Wellcome Trust and the Health Research Council of New Zealand. We used these data to investigate the incidence and characteristics of childhood injuries in Fiji to inform national injury prevention efforts.

Methods

The cross-sectional analysis used data on all children (<15 years) who died or were admitted to hospital in Viti Levu for 12 h or more following an acute injury during the 12-month period, 1 October 2005 to 30 September 2006. Only first admissions were considered, and hospitalisations for late effects were excluded.

Viti Levu is the main island of Fiji and is home to 77.7% (650 640) of the country's resident population (840 000). Fiji has two main ethnic groups, the indigenous Fijians and Indians who make up 54.4% and 40.0% of Viti Levu's population, respectively.

Eligible cases were identified prospectively from admission records in all hospitals and the mortuary registers at the two divisional hospitals where *post-mortems* are conducted on all injury-related deaths in Viti Levu. Hospital and mortuary registries were reviewed by the research team to identify any cases with injuries as their principal diagnoses or whose history indicated an injury mechanism. A 23-item injury surveillance form adapted from the World Health Organisation (WHO) Injury surveillance guidelines (2001)[6] captured demographic details and a minimum dataset regarding the injury including the mechanism, intent, nature (primary injury diagnosis), place and activity, and duration of hospitalisation. Data were collected by research assistants, nurses and medical students, and the system was audited for data quality and completeness on a weekly basis during the study period.

Statistical analysis was undertaken using Epi Info (Center for Disease Control and Prevention, Atlanta, GA, USA), with annual population-based rates computed using denominator data from the most recent census period (2007) provided by the Fiji Bureau of Statistics. Ethical approval for the study was obtained from the Fiji National Research Ethics Review Committee and the University of Auckland Ethics Committee.

Results

During the 12-month study period, 496 children were admitted to hospital or died as a result of injury, corresponding to an annual rate of 271.4/100 000 (Table 1). Most injuries were categorised as unintentional (n = 469; 94.6%), the remainder identified as intentional (19), or of undetermined (6) or unknown (2) intent. Children aged 5–9 years had the highest rate of injury (320.3/100 000) compared with those aged 0–4 and 10–14 years (261.5/100 000 and 235.5/100 000, respectively). The rate of injury among males (350.1/100 000) was almost twice that among females (187.5/100 000). The overall rates of injuries among Fijian children aged 5–9 and 10–14 years were almost double those of Indian children in these age groups. In contrast, the ethnic-specific injury rates were similar among pre-school aged children. The highest injury incidence rate was among Fijian children aged 5–9 years (375.7/100 000).

Most injuries occurred at home (63.1%), on the road (15.7%) or at school (6.9%), while the place of injury was unknown for 3.8%. Leisure and recreation (75.4%) and travel (13.1%) were the activities most commonly associated with most injuries. Based on data extracted from clinical or *post-mortem* records, fractures (31.9%), head injuries including skull fractures (15.1%), cut/bite/open wounds (13.7%) and burns (12.3%) were the most common principal injury diagnoses. Rates of head injury and fracture were highest among 5- to 9- and 10- to 14-year-olds while the under 5-year age group had the highest rate of burns.

Fatal injuries

Of the 28 injury-related fatalities in childhood during the study period, most (n = 23; 82.1%) died prior to admission. The overall injury death rate for children was 15.3/100 000. The death rate was highest among those aged 0–4 years (23.9/100 000). Boys accounted for 60.7% (17/28) of deaths. Most deaths (n = 25; 89.3%) were deemed to be of unintentional intent. The leading causes of fatalities were road traffic injuries (28.6%), choking (25%) and drowning (17.9%). Choking was the most common cause of injury death in under 5-year-olds, while road traffic injuries were the leading cause among 5- to 9- and 10- to 14-year-olds.

Hospital admissions for injury

Children accounted for 23.6% (n = 485/2059) of all injury admissions in Viti Levu during the study period, corresponding to an annual age-specific hospital admission rate of 265.4 per 100 000. Children aged 5–9 years had the highest rate of admission (322.1/100 000) compared with those aged 0–4 and 10–14 years (250.4/100 000 and 227.4/100 000, respectively).

Falls were responsible for almost half (48%) of the injury admissions, followed by fire/heat/scalds/electrical burns (12.5%), road traffic injury (11.4%) and being hit by a person or object (10.4%, n = 49/473). The admission rates for boys were higher for all six leading causes of injury with the exception of poisoning (Fig. 1). Children aged 5–9 years old experienced the highest rates of falls, road traffic injuries and being hit by person or objects, while those aged less than 5 had higher rates of fire/heat/scalds/electrical burns and poisoning-related injuries (Fig. 2). The mean length of stay in hospital was 9 days (median 3 days; interquartile range (IQR) 1–6 days). Burns accounted for longest hospitalisations (median 5 days; IQR 3–9 days).

Discussion

Childhood injuries accounted for just under a quarter of all injuries recorded during the 12-month period of surveillance of

Table 1 Childhood injury rates per 100 000 by gender, ethnicity and nature of injury in Viti Levu, Fiji, October 2005 to September 2006

	Age group							
	0–4 years (*n* = 164)		5–9 years (*n* = 186)		10–14 years (*n* = 146)		Total (*n* = 496)	
	n	Rate† (95% CI)	*n*	Rate† (95% CI)	*n*	Rate† (95% CI)	*n*	Rate† (95% CI)
Total	164	261.5 (221.5–301.6)	186	320.3 (274.3–366.4)	146	235.5 (197.3–273.7)	496	271.4 (247.5–295.3)
Gender								
Females	74	244.5 (188.8–300.2)	49	174.9 (125.9–223.9)	43	142.2 (99.7–184.7)	166	187.5 (159.0–216.4)
Males	90	277.4 (220.1–334.7)	137	455.9 (379.6–532.3)	103	324.3 (261.7–387.0)	330	350.1 (312.3–387.9)
Ethnicity								
Fijian	107	263.2 (213.4–313.1)	138	375.7 (313.0–438.4)	105	293.4 (237.3–349.5)	350	310.2 (276.9–341.7)
Indian	51	274.4 (199.3–350.1)	44	243.3 (171.4–315.2)	33	145.4 (95.8–195.0)	128	215.7 (178.3–253.1)
Other	6	171.6 (34.3–308.9)	4	123.2 (2.5–244.0)	8	175.4 (94.4–256.5)	18	175.4 (94.4–256.5)
Nature of injury								
Fractures	23	36.7 (21.7–51.7)	82	141.2 (110.7–171.8)	53	85.5 (62.5–108.5)	158	86.4 (73.0–99.9)
Head	26	41.5 (25.5–57.4)	32	55.1 (36.0–74.2)	17	27.4 (14.4–40.5)	75	41.0 (31.7–50.3)
Burns	42	67.0 (46.7–87.2)	16	27.6 (14.1–41.1)	‡	4.8 (–0.6–10.3)	61	33.4 (25.0–41.7)
Cut/bite/open wound	7	11.2 (2.9–19.4)	25	43.1 (26.2–59.9)	36	58.1 (39.1–77.0)	68	37.2 (28.4–46.0)
Other injuries	64	102.1 (77.1–127.1)	30	51.7 (33.2–70.2)	36	58.1 (39.1–77.0)	130	71.1 (58.9–83.4)
Cause of injury								
Falls	43	67.0 (46.7–87.2)	106	182.6 (147.8–217.3)	78	125.5 (97.9–153.7)	227	124.2 (108.0–140.4)
Fire/heat/scalds/electrical	42	65.4 (45.4–85.4)	16	27.6 (14.1–41.1)	‡	‡	61	33.4 (25.0–41.7)
Road traffic	15	27.1 (14.2–40.0)	27	46.5 (29.0–64.0)	16	25.8 (13.2–38.5)	60	32.8 (24.5–41.1)
Hit by person/object	12	19.1 (8.3–30.0)	19	32.7 (18.0–47.4)	18	29.0 (15.6–42.4)	49	26.8 (19.3–34.3)
Poisoning	25	39.9 (24.2–55.5)	‡	‡	7	11.3 (2.9–19.7)	33	18.1 (11.9–24.2)
Other causes	25	39.9 (24.2–55.5)	17	29.3 (15.4–43.2)	24	38.7 (23.2–54.2)	66	36.1 (27.4–44.8)

†2007 Viti Levu (Fiji) census data. ‡Data suppressed if less than four per cell. CI, confidence interval.

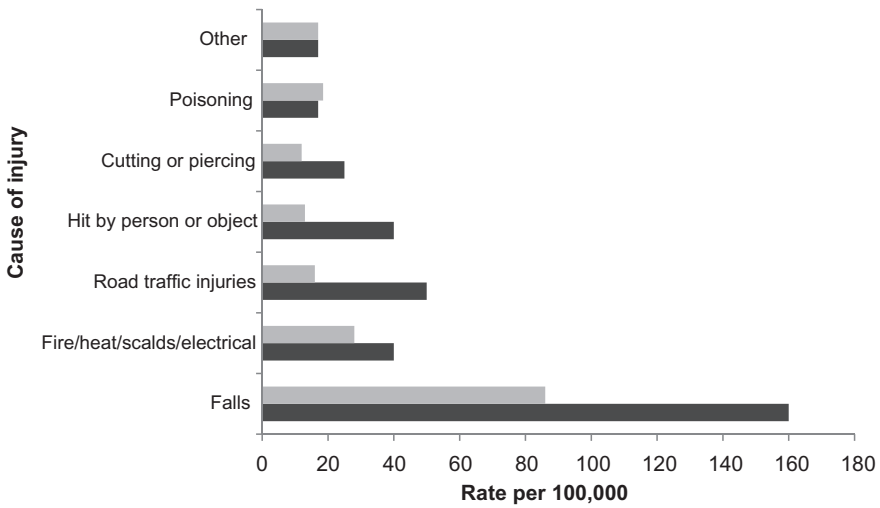

Fig. 1 Hospital admission rates per 100 000 children aged < 15 years by cause of injury and sex, Viti Levu, Fiji (*n* = 473). (▒) Females, (■) Males.

hospital injury admissions and deaths in Viti Levu, Fiji. Males and children of indigenous Fijian ethnicity were over-represented in these data. Overall injury rates were highest among children aged 5–9 years, although fatal injury rates were higher among children aged less than 5 years. The majority of childhood injuries resulting in admission to hospital or death occurred at home. Falls and burns were the leading mechanism of injury resulting in hospital admission, while road traffic injury and choking were the leading mechanism of fatal injury. Fractures and head injuries were the most frequent principal injury diagnoses, while burns accounted for the longest admissions to hospital.

This is the first population-based study that has attempted to characterise childhood injuries that result in death or hospital

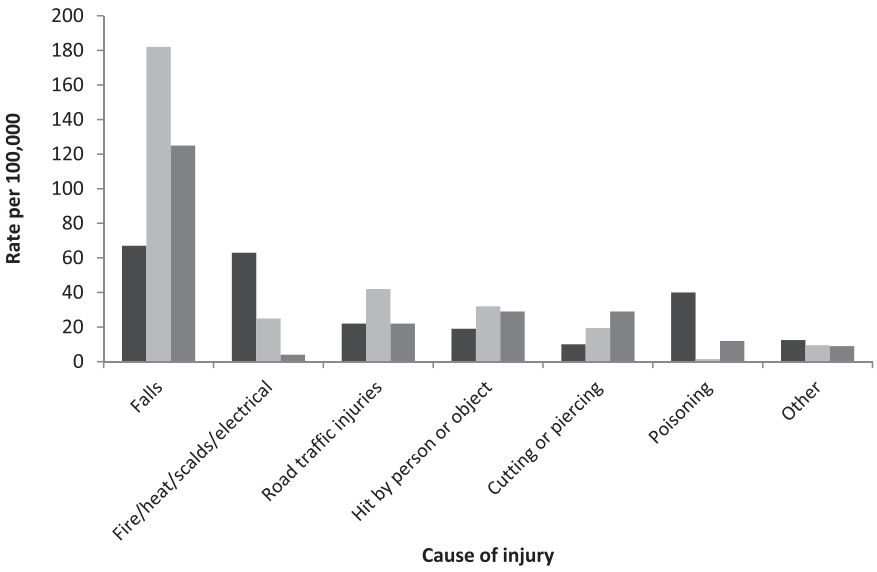

Fig. 2 Childhood injury hospitalisation rates per 100 000 children by cause and age group, Viti Levu, Fiji (n = 473). (■) 0–4 years, (■) 5–9 years, (■) 10–14 years.

admission in Fiji. By adapting a standardised surveillance system for less-resourced settings recommended by the WHO and implementing a systematic audit process to assure the quality and completeness of data collection, we generated a database that was capable of addressing a major gap in epidemiologic data on childhood injuries from Pacific Island countries and territories. However, the findings must be interpreted in light of several limitations.

While the study had the advantage of one full year of data, the relatively small numbers of cases in some subgroups precluded the opportunity to obtain precise estimates of injury incidence in all categories of interest. The minimum dataset employed also lacked valid measures of injury severity, socioeconomic status and pre-existing co-morbidities. As with most surveillance databases, there was no information on the levels of exposures of relevance (e.g. time spent walking, cycling or being driven in a car; engagement in recreational activities).

The over-representation of boys in the injury presentations, the increased risk of fatal injuries among children less than 5 years and the predominance of falls among admissions to hospital are epidemiological patterns consistent with childhood injuries in many countries world-wide.[2,7–9] However, compared with the international literature, estimates of road traffic injury and drowning deaths in Fiji were lower and injuries resulting in choking were higher.[2,10–12]

The extent to which these epidemiologic patterns (limited by only 1 year of data) are (i) representative of childhood injuries in Fiji more generally and (ii) influenced by access to health care or other factors requires further investigation. While most acute injuries are considered likely to present to hospitals, we cannot exclude the possibility of under-reporting of injuries, particularly including mechanisms such as intentional injuries.

This study was not designed to examine the burden of injuries which did not result in hospital admission. Community-based surveys could address this gap, providing a more complete profile of the burden of child injuries, including the risks of longer-term disability. A study in Vietnam estimated that the cost of injury to socially disadvantaged households was equivalent to income over 11 months.[13] Unmet needs with regard to health, rehabilitation, educational and social services following childhood injury are likely to be particularly high in impoverished communities.[14]

The FISH system was intended to collect data for a 12-month period during the conduct of the situational analysis phase of the overall research project. The aim was to obtain a comprehensive baseline profile as opposed to ensuring a sustainable ongoing surveillance system. Currently, efforts are underway to enhance the routine health information system in Fiji including improving the quality of routinely collected injury data that could serve as a sustainable mechanism by which to monitor ongoing trends in injury occurrence.

As noted by previous commentators[8,15] and collated in the World Report on Child Injury Prevention,[2] there are many contextual factors and wider social determinants that can account for the occurrence and disparities in the experience of injury, both between and within countries. These issues require particular consideration in Fiji and other Pacific Island countries in order to prioritise strategies that are likely to be most appropriate for the setting, drawing on the increasing body of knowledge on effective child injury prevention interventions globally.[2]

The World Health Assembly resolution in 2011 urges all countries to implement the recommendations of the world report on child injury prevention, adopting plans of action with realistic targets.[1] Priority areas identified include encouraging research, building capacity and mobilising resources to establish evidence-based policies to prevent child injury and providing technical support to implement prevention measures and strengthen emergency and rehabilitation services.[2]

The two leading causes of childhood injury identified in this review of the FISH database were road traffic injury and falls. While more detailed research is required to understand the specific risk factors contributing to these injuries (e.g. types of road users involved, environmental and related characteristics surrounding serious falls) to develop and implement evidence-

based strategies relevant to the Fiji context, other international studies provide useful guidance that is likely to be informative. For example the World Report on Child Injury Prevention[2] and the Child Safety Good Practice Guides,[16] which form the basis of the European Child Safety Report Cards, have indicated a range of injury prevention strategies that are likely to be beneficial for childhood injuries in LMICs. There is strong evidence that correctly installed child passenger restraint systems can reduce road traffic-related deaths among infant passengers by up to 70%.[2] Seats belts are currently not required in Fiji.

The present study has begun to address some key areas to progress this agenda in Fiji. The capacity and capability to respond to child injury as a major child survival and health issue in Pacific Island countries and territories are long overdue. The implications for the future workforce, health-care system and economic development of these countries make it imperative that child health programmes in the Pacific region be expanded to include child injury prevention as a priority.

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