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All-terrain vehicle crashes and associated injuries in north Queensland: Findings from the Rural and Remote Road Safety Study

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Abstract

Objective: To define characteristics of all-terrain vehicle (ATV) crashes occurring in north Queensland from March 2004 till June 2007 with the exploration of associated risk factors.

Design: Descriptive analysis of ATV crash data collected by the Rural and Remote Road Safety Study.

Setting: Rural and remote north Queensland.

Participants: Forty-two ATV drivers and passengers aged 16 years or over hospitalised at Atherton, Cairns, Mount Isa or Townsville for at least 24 hours as a result of a vehicle crash.

Main outcome measures: Demographics of participants, reason for travel, nature of crash, injuries sustained and risk factors associated with ATV crash.

Results: The majority of casualties were men aged 16–64. Forty-one per cent of accidents occurred while performing agricultural tasks. Furthermore, 39% of casualties had less than one year's experience riding ATVs. Over half the casualties were not wearing a helmet at the time of the crash. Common injuries were head and neck and upper limb injuries. Rollovers tended to occur while performing agricultural tasks and most commonly resulted in multiple injuries.

Conclusions: Considerable trauma results from ATV crashes in rural and remote north Queensland. These crashes are not included in most general vehicle crash data sets, as they are usually limited to events occurring on public roads. Minimal legislation and regulation currently applies to ATV use in agricultural, recreational and commercial settings. Legislation on safer design of ATVs and mandatory courses for riders is an essential part of addressing the burden of ATV crashes on rural and remote communities.

KEY WORDS: *agricultural, all-terrain vehicle, quad bike, recreational, risk*

What is already known on this subject

- All-terrain vehicle (ATV) crashes contribute significantly to morbidity and mortality in rural and remote Australia.
- There are approximately 10 ATV-related deaths nationwide each year.
- Risk factors for ATV crashes are younger age, male drivers, inexperience, no helmet use and greater engine size.
- Current policy attempts to address the number of accidents occurring in the agricultural setting.

What this paper adds

- Recreational ATV crashes contribute significantly to the number of ATV crashes in addition to agricultural ATV crashes.
- Agricultural riders are more likely to be involved in a rollover crash than recreational riders who are more likely to fall from an ATV.
- The most common injuries of ATV riders are head and neck and upper limb injuries.
- Alcohol use in recreational riders and lack of helmet use in agricultural riders are a concern that could be addressed through legislation and education.

Introduction

All-terrain vehicles (ATVs), also known as quad bikes or four-wheeled motorcycles, are a significant contributor to morbidity and mortality in rural and remote Australia. 1 There are approximately 10 deaths associated with ATVs each year across Australia.[1,2] In addition, ATVs have been contributing to a rising number of workers compensation claims.[1]

Over the past five years there has been a 43% increase in the sales of ATVs in Australia.[3,4] Changes in farming practices over the past decade have led to greater use of the ATV over more traditional methods such as horses, tractors, two-wheel motorcycles and utilities.[1] Evidence shows that although there are a greater number of injuries associated with the use of horses, there are fewer deaths than with ATVs.[5] In addition, ATVs also double as recreational vehicles which make them attractive to a younger age group of potential riders [3,6].

However, as most ATV crashes occur off-road there has been limited data collection on the number and type of injuries and fatalities.[6] A 2002 trial by the Victorian State Coroner identified at least 20 ATV fatalities across Australia in just over two years.[7] As a result of this review, state Occupational Health and Safety Authorities have issued warnings about the danger of ATVs and Technical and Further Education (TAFE) training courses have been developed to better prepare riders on safe use of ATVs.[7]

Recent data identify a number of risk factors for ATV injury including younger age (less than 16 at particular risk), male drivers, three-wheel ATVs, inexperience, lack of helmet use and greater engine size.[1,8,9] As a result of this and other research, Farmsafe Australia adopted a national strategy which targets safer design, induction and training courses and enforcement of helmet and other personal protective equipment use.[10-12]

Despite this work, there remains a great need to legislate and educate about ATV safety in both agricultural and recreational settings. Better data collection on deaths and injuries associated with ATVs may also go some way to showing the significant contribution which ATVs make to motor-vehicle crashes in Australia each year.

The data discussed here is sourced from the findings of the Rural and Remote Road Safety Study (RRRSS) conducted by the Centre for Accident Research and Road Safety Queensland and the Rural Health Research Unit, James Cook University. The final phase of the project was a comprehensive analysis of data collected from the north Queensland study area between March 2004 and June 2007. The aim of this data collection was to identify human factors related to serious traffic incidents in rural and remote areas of Australia, and to identify the trauma suffered as a result of these incidents. This paper specifically presents the findings of this study with respect to ATV casualties.

Method

Data collection occurred during the RRRSS from March 2004 up to and including June 2007. It involved administration of a questionnaire and medical data collection from patient charts and the clinical information services for all eligible participants. Ethics approval was granted by the appropriate ethics committees.

Selection of cases

All crashes in north Queensland that resulted in a serious injury or fatality in the period from 1 March 2004 to 30 June 2007 were eligible for inclusion provided that the vehicle crash occurred in the study catchment area (Fig. 1) and resulted in at least one participant older than 15 years being killed or admitted to hospital for at least 24 hours.



FIGURE 1: *North Queensland study area statistical divisions. The study area was defined as that part of Queensland north of Bowen in the east and Boulia in the west. The study area included the Gulf of Carpentaria and Torres Strait Islands, but excluded the urban centres of Cairns and Townsville. Total land area of approximately 796 000 square kilometres.*

Identification of cases

Daily scans of road crash admissions were undertaken by research staff in The Townsville Hospital, Cairns, Mount Isa and Atherton Base Hospitals. Local media were studied daily to identify potential crashes. The geographical location of crashes was mapped using MapInfo.

Circumstances of crash

Patients were approached for an interview to collect data on the circumstances of the crash. Of the 42 ATV casualties, 18 participated. Short narratives of the events leading to crash were recorded as were previous driving experience and offences, helmet use and Alcohol Use Disorders Identification Test C (AUDIT-C) (alcohol use questionnaire).

Medical data

Medical data included admission vital signs, use of helmets and alcohol involvement. Clinical benchmarking data provided type of injury and clinical interventions using International Classification of Disease, version 10, length of stay and admission outcome (i.e. discharge, transfer or death).

Results

During the study period, there were 42 ATV rider and passenger casualties who required hospitalisation. This made up 6.1% of all casualties involved in the RRRSS.

ATV riders were the majority of casualties in this group ($n = 39$) compared with pillion passengers ($n = 3$). There were no fatalities in the ATV group during the study period. The majority of casualties involved in ATV crashes were male ($n = 31$). Figure 2 illustrates casualties by age group and gender.

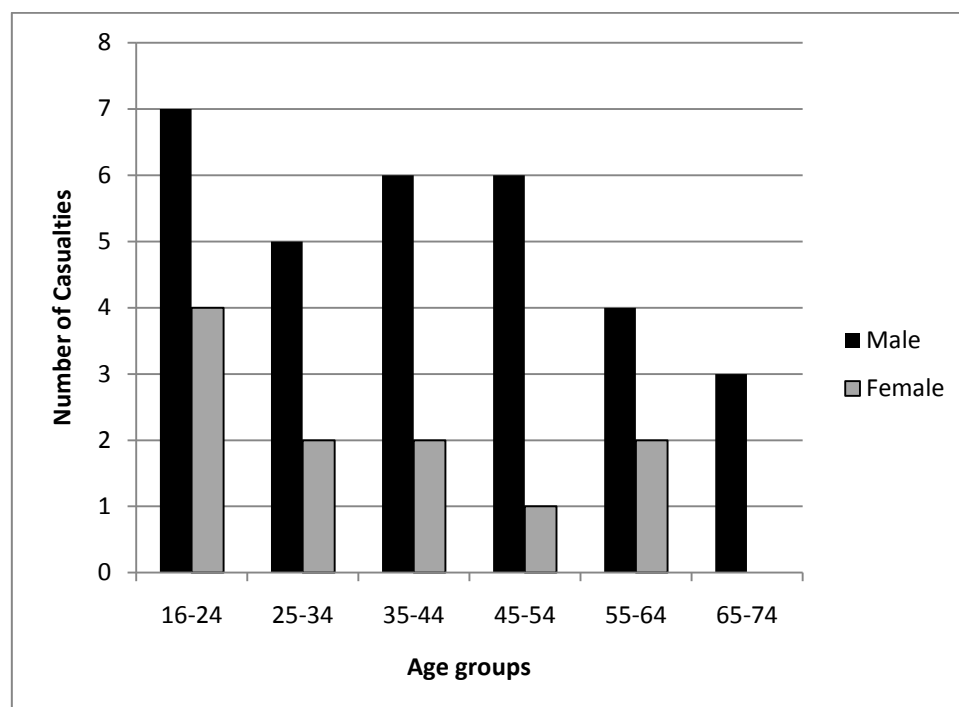


FIGURE 2: Gender age groups of casualties

Most crashes occurred on private property ($n = 37$) followed by public road/land ($n = 5$). Of those crashes that occurred on private property, 33% ($n = 14$) were while performing agricultural tasks;

33% were during recreational travel and 26% were for unknown reasons. Five of the recreational ATV crashes occurred at ATV recreational parks under the supervision of staff. Of the 18 riders who were interviewed, 39% ($n = 7$) had less than one year of experience riding ATVs.

Alcohol involvement and helmet use

Six ATV riders (15%) and two ATV passengers (67%) were reported in hospital admission notes to be intoxicated with alcohol at the time of the crash. Of the eight casualties who were intoxicated, seven were not wearing helmets and one had unknown helmet status. Of those not wearing helmets and intoxicated, five suffered varying degrees of head injury from scalp abrasions to skull and facial fractures. Overall, 53% of casualties were not wearing a helmet at the time of their crash ($n = 22/42$) and 13 had unknown helmet status.

Nature of crash

Figure 3 illustrates the relationship between nature of crash and reason for travel. Those casualties travelling for recreational purposes were more likely to fall from the bike while those travelling for agricultural reasons were more likely to be injured in a rollover crash ($p = 0.5724$).

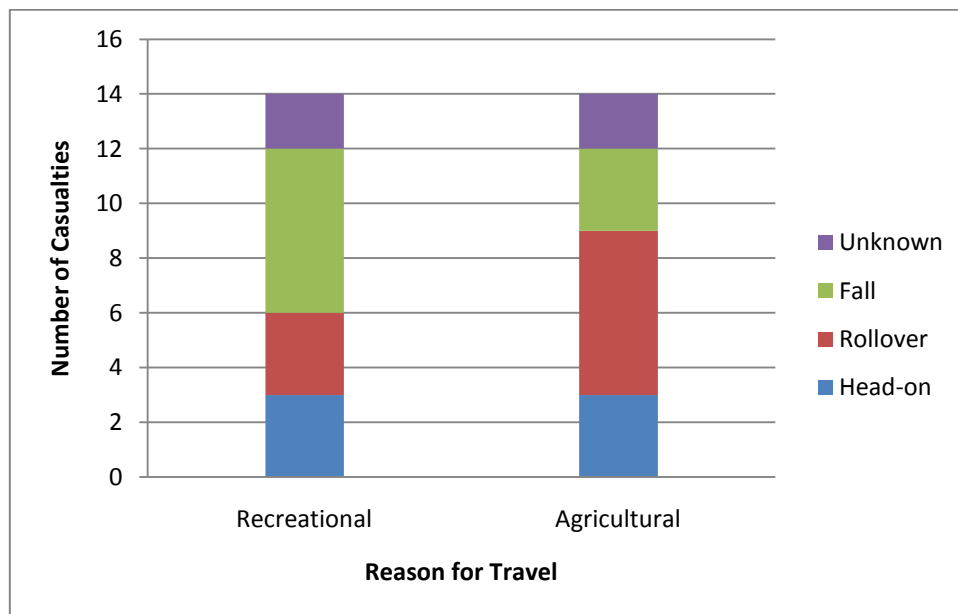


FIGURE 3: Nature of crash and reason for travel.

Injuries sustained

All-terrain vehicle riders commonly sustained head and upper limb injuries regardless of the nature of the crash. Two of the 18 patients who sustained head injuries were wearing helmets. Sixty-four per cent of patients who were not wearing a helmet sustained a head injury ($n = 14/22$, $p = 0.1593$).

Fifteen patients were involved in rollover crashes and 11 of these sustained multiple injuries. Most common injuries were to the pelvis/abdomen ($n = 8$), upper limb ($n = 7$) and head/neck ($n = 7$). Twelve patients sustained injuries through falls from ATVs. Nine of these patients suffered multiple injuries which were most likely to be upper limb injuries ($n = 6$). Figure 4 illustrates the common crash types along with the injuries each crash type was most likely to cause.

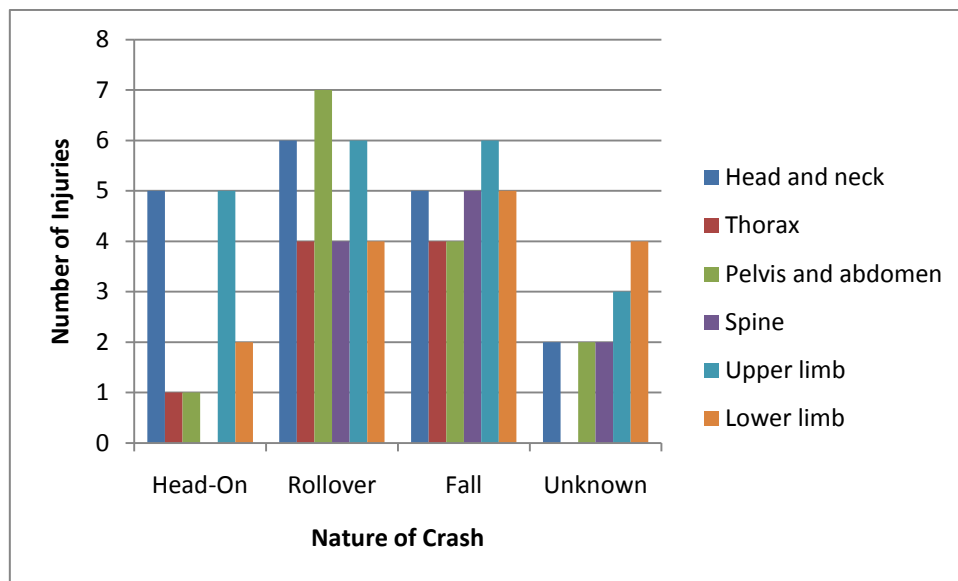


FIGURE 4: *Nature of crash and injuries sustained.*

Crash patterns in case studies

Case study 1: 17-year-old man

The passenger of an ATV described his experience of a Friday night with friends on a rural property. We were having a few drinks. I had drunk 5 beers. Then we all just decided to go for a ride, to be doubled to the motorbike jumps. I remember we were leaving, but I don't remember anything else.

He was not wearing a helmet and fell backwards from the bike while travelling as a pillion passenger at approximately 40 km h⁻¹. He sustained superficial head wounds, loss of consciousness and abrasions to chest, shoulder, upper arm, abdomen, lower back and pelvis. The majority of recreational riders were male ($n = 9/14$) with ages ranging from 18 to 61 (average age 32 years). Six of the 14 were intoxicated with alcohol and six were not wearing a helmet at the time of the crash.

Case study 2: 64-year-old woman

Friday morning, a woman was mustering cattle on a property.

... I turned my bike around to chase after them [cattle] and the quad bike got stuck on an ant's nest... I revved the bike... and it took off into the air very fast... I was only on two wheels going flat out down the hill. I threw myself off one side as the bike came crashing down on the other side and it didn't hit me.

This was a lucky escape by an experienced rider who knew how to avoid being crushed by the ATV. However, she did sustain a laceration to head (not wearing helmet), fracture of pubis and contusions on lower back and pelvis.

Of the agricultural riders, 29% were female ($n = 4/14$). Rider ages ranged from 24 to 66 years (average age 56 years). None of the agricultural riders were intoxicated; however, nine of the 14 riders were not wearing a helmet at the time of their crash.

Case study 3: 42-year-old male

The casualty was riding with a group on a recreational commercial property. He related a story of inexperience and poor preparation. I pushed my foot down on the brake . . . but with my hand I was both squeezing the brake and pressing the accelerator at the same time. The bike basically kept going and propelled me over a small cliff and down the embankment. I hit a tree...

This man was wearing a helmet (though not full-face) and sustained a fractured arm. Other casualties on recreational commercial properties expressed a feeling of not receiving adequate training before using the ATVs. There were five confirmed cases of ATV crashes which occurred on commercial recreational parks in north Queensland. The riders were of varying ages and genders. However, the common thread was their lack of experience on ATVs.

Characteristics of hospital treatment

Length of time spent in hospital ranged from 1 to 43 days. All ATV casualties had an average length of stay of seven days (Interquartile range (IQR) 2–8). The longest stay in intensive care unit (ICU) in the whole study was by an ATV rider who was admitted for 39 days. Fourteen per cent of ATV riders ($n = 6$) were admitted to an ICU with an average length of stay of 10 days (IQR 2–19).

Discussion

The ATV injury data collected from the RRRSS indicates that ATVs contribute significantly to morbidity of rural and remote north Queenslanders. The findings reported in this study strengthen the case for closer attention to this important cause of preventable injury and death.

The study's data collection was limited as there were no police reports filed because most of the ATV crashes occurred on private property. Furthermore, the small sample size limits the generalisability of the findings of this study. In addition, this study illustrates a high number of recreational ATV crashes occurring on specifically designed commercial properties.[6] However, this finding may not be generalisable as there are fewer ATV recreational properties in other parts of rural Australia. Regardless, the majority of deaths continue to occur in agricultural settings, perhaps due to the nature of the crash. This study, along with previous data shows that agricultural crashes are more likely to be rollovers and cause injuries such as thorax crush and head injuries.[1,11].However, further research should be conducted in order to confirm or deny these findings.

This study suggests that there are three main groups of ATV riders: recreational riders/passengers mostly on private property; agricultural riders; and recreational riders on commercial properties under supervision. Recreational riders/passengers tended to be male, of younger age (average age was 32 years) and were more likely to be intoxicated with alcohol. Narrative data suggests that in many cases, the ATV trip was not planned, rather it was spontaneous because an ATV could be accessed easily. These crashes tended to occur late in the evening or in the early hours of the morning and were often associated with riders attempting manoeuvres for which the ATV was not designed such as motorbike jumps.

Agricultural riders were older on average than their recreational rider counterparts. At the time of the crash many casualties were mustering and checking stock. Narrative data suggest that common causes of crashes were cattle charging at the ATV or collision with a termite mound (common in north Queensland). Furthermore, agricultural riders were less likely to be wearing a helmet than their recreational rider counterparts. These case studies illustrate the risk factors in ATV injury are younger age, lack of experience/supervision and lack of helmet use. In order to address these factors and reduce the morbidity and mortality associated with ATVs, legislation must address safety issues associated with ATVs. In addition, there needs to be greater education, training and support of ATV riders of all ages and experience levels, to ensure correct riding technique and vehicle loading is employed. Finally, the use of helmets must be encouraged, legislated and policed.

References

1. Fragar LJ, Pollock K, Morton C. *ATV Injury on Australian Farms – The Facts*. Moree, NSW: Australian Centre for Agricultural Health and Safety, 2007; 24. Report No.: 07/149.
2. Australian Institute of Health and Welfare. *Rural, Regional and Remote Health: A Study on Mortality*, 2nd edn. Canberra, ACT: AIHW, 2007; 361. Report No.: Rural health series no. 8.; cat no. PHE 95.
3. Hockey R, Scott D, Spinks D. *ATV and Lawnmower Injuries*. Brisbane, Qld: Queensland Injury Surveillance Unit, 2004. Apr. 4p. Report No.: 81.
4. Federal Chamber of Automotive Industries. *Motorcycle Sales 2007 [Internet]*. Canberra, ACT: Federal Chamber of Automotive Industries, 2008 (Jan 17). [cited 28 Sep 2008]. Available from URL: <http://www.fcmai.com.au/motorcycles/introduction>
5. Harrison JE, Berry JG, Australian Institute of Health and Welfare. *Serious Injury due to Transport Accidence, Australia, 2003–04*. Canberra, ACT: AIHW & ATSB, 2007. Report No.: INJCAT 101.
6. Blackman R, Cheffins T, Veitch C, O'Connor T. At work or play: A comparison of private property vehicle crashes with those occurring on public roads in north Queensland. *Australian Journal of Rural Health* 2009; **17**: 189–194.
7. National Coroners Information System. *The Benefits of National Coroners Information System [Internet]*. Melbourne, VIC: National Coroners Information System, 2005. [cited 13 Aug 2008]. Available from URL: http://www.vifp.monash.edu.au/ncis/web_pages/Benefits%20of%20NCIS%20_update%20Oct%2005_.pdf
8. Rodgers G, Adler P. Risk factors for all-terrain vehicle injuries: a national case-control study. *American Journal of Epidemiology* 2001; **153**: 1112–1118.
9. Lower T, Egginton N, Ellis I, Larson A. *Reducing All-Terrain Vehicle Injuries: A Randomised Control Study of the Effect of Driver Training*. Canberra, ACT: Rural Industries Research and Development Corporation, 2005. Report No.: 04/174.
10. Farmsafe Australia. *Safe Operation of All-Terrain Vehicles and All-Terrain Utilities on Australian Farms; An Industry Strategy 2004–2009 [Internet]*. Moree, NSW: Farmsafe Australia, 2004; 19. [cited 14 Aug 2008]. Available from URL: <http://www.farmsafe.org.au/document.php?id=60>
11. Fragar L, Pollock K, Temperley J. *A National Strategy for Improving ATV Safety on Australian Farms*. Moree, NSW: Australian Centre for Agricultural Health and Safety, 2005; 50. Report No.: 05/082.
12. Farmsafe Australia. *Safety of All-Terrain Vehicles and Small Utility Vehicles on Australian Farms – A Practical Management Guide [Internet]*. Moree, NSW: Australian Centre for Agricultural Health and Safety, 2006. [cited 13 Feb 2009]. Available from URL: <http://www.farmsafe.org.au/document.php?id=68>