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Rise in injury rates for older male motorcyclists: An emerging medical and public health concern

A study of injury data found hospitalization costs for older male motorcyclists in BC rose by 60% from 2001 to 2010.

ABSTRACT

***Background*: Findings from research in the United States show an increase in injury and mortality rates among older male motorcycle riders. Because trends in ridership and injuries have not been well investigated in Canada, we undertook a study to determine the effect of the increasing age of male motorcycle riders on injury patterns in British Columbia.**

***Methods*: To examine the relationship between rider age and injury patterns, we analyzed data from British Columbia's motorcycle-related Discharge Abstract Database for 2001 to 2010.**

***Results*: We found the motorcycle-related hospitalization rate for males age 45 to 74 increased significantly from 18.4 to 36.0 per 100 000 population over the study period, and hospitalization costs rose by 61%. The rate for younger male riders and both younger and older female riders did not change significantly. Findings indicated longer hospital stays and different injury patterns for older male riders compared with younger male riders, and higher hospitalization rates for older male riders in less urban parts of BC.**

***Conclusions*: Our findings suggest the need for an evidence-based injury prevention initiative targeting older male motorcycle riders. Such an initiative could include injury prevention counseling by health care providers and the development of other strategies to prevent motorcycle-related injuries among older male riders.**

Background

Transportation industry statistics from the United States and reports from US researchers indicate an increase in injury and mortality rates for older male motorcyclists.[1-3] Although Canadian statistics are not as readily available, the Canada Safety Council cites an average age of 46 among motorcycle buyers and has seen an increase in the age of riders in their training programs.[4]

Langley and colleagues[5] postulate that baby boomers born between 1946 and 1965 would have used motorcycles when younger as an inexpensive form of transportation, and that as older adults with more disposable income they may be returning to riding after a prolonged hiatus. Other research confirms a movement toward motorcycling as a leisure activity rather than as a transportation choice.[6] Likewise, compared with younger male motor-

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cyclists, older male motorcyclists tend to make more trips on high-powered motorcycles, which in turn are linked with higher mortality rates.[7] Of concern are age-related changes in physical and cognitive ability that can affect driving ability, particularly when drivers are on heavy, powerful machines.[8]

Recent evidence from the US points to increased risk of injury for older motorcycle riders. In an analysis using National Electronic Injury Surveillance System data for motorcycle crash injuries treated in emergency departments from 2001 to 2008, adults age 60 and older were found to have the greatest rate of increase in injuries, were more likely to be hospitalized, and suffered more severe injuries than younger riders.[9] Another study found that patients over 50 with motorcycle-related injury trauma required more aggressive treatment and longer hospital stays, but did not have more severe injuries than patients under 50.[10]

Trends in motorcycle ridership and injury patterns have not been well investigated in Canada, despite potential safety concerns and implications for the health care system. Our objective was to analyze hospitalization data to examine the influence of the increasing age of male motorcyclists on injury patterns and outcomes in British Columbia.

Methods

The Injury Data Online Tool (iDOT) developed by the BC Injury Research and Prevention Unit[11] was used to investigate the hospitalization rates for motorcycle injuries in BC from 2001 to 2010. Using iDOT's Discharge Abstract Database we categorized injuries according to the *International Statistical Classification of Diseases (10th Revision)*. The *ICD-10* classification of motorcycle rider injury (V20-V29) includes injuries related to use of mopeds, motorized bicycles, and scooters. The calculation of rates using iDOT is based on the rate of injury per 100 000 population, hospitalization costs, hospitalization length of stay (LOS), and hospitalization rates in various geographical areas. The LOS data are provided as cumulative time in hours for subsets of a population over the past decade (2001 to 2010), and the hospitalization rates in various geographical areas are provided as ranges.

We used the statistical software package IBM SPSS 20 to examine trends in motorcycle injury rates, hospitalization costs, LOS, nature and location of injury, and geographical location of injury for older (age 45 to 74) and younger (age 20 to 44) motorcyclists. These age groups were chosen to allow a comparison of the post–Second World War baby boom generation with the following generation. In 2010, the youngest of the baby boom cohort was 45 years old.

We used linear regression to investigate the relationship between time and motorcycle injury rates, using year as a predictor and stratifying by age group and sex. We also used linear regression to examine trends in hospitalization costs, using year as a predictor and stratifying male motorcyclists by age group. To calculate the difference in LOS for older and younger male motorcyclists, a z test was performed on the mean LOS of each age group. Relative risks with 95% confidence intervals were calculated to compare nature and location of injury of older and younger male motorcyclists.

Results

From 2001 to 2010, there were 5444 motorcycle-related injuries for men age 20 to 74, with 3421 injuries (62.8%) in the younger group (20 to 44 years) and 2023 injuries (37.2%) in the older group (45 to 74 years).

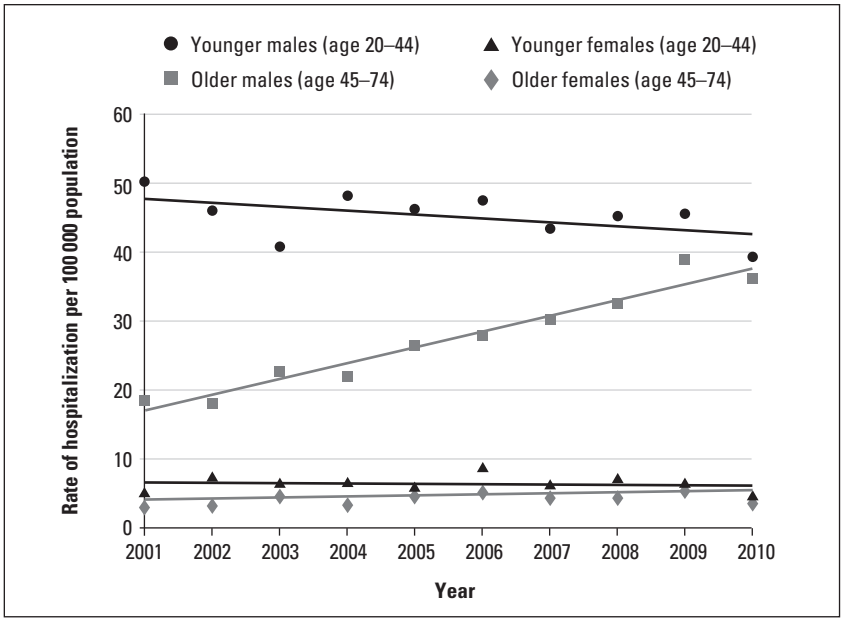

Figure 1. Motorcycle-related hospitalization rates in BC by age and sex, 2001 to 2010.

Table 1. Relative risk of injury for older male motorcyclists compared with younger male motorcyclists in BC by nature of injury, 2001 to 2010.

Nature of injury	Relative risk (95% CI)
Injury to muscle/tendon/ vessel	2.04 (1.34-3.10)
Injury to internal organ	1.45 (1.20-1.75)
Injury to nerve/spinal cord	1.57 (1.07-2.29)
Dislocation/sprain/strain	0.54 (0.41-0.73)
Fracture	0.95 (0.92-0.99)
Head injury	1.21 (0.87-1.70)
Intracranial injury (excludes concussion)	1.13 (0.92-1.40)
Superficial/open wound	0.99 (0.78-1.24)

Over this 10-year period, we found a significant increase in motorcycle-related injuries among men age 45 to 74 years—an increase not found among women or younger men (**Figure 1**). In 2001, the hospitalization rate for older males was 18.4 per 100 000, which doubled to 36.0 by 2010. With every year there was a 0.97 increase in rate ($P < .000$). In contrast, the rate for males age 20 to 44 years dropped from 50.0 to 39.1 per 100 000 during the same time (average annual rate change = –0.52; $P > .10$). Hospitalization rates for older females increased from 3.0 to 4.0 (average annual rate change = 0.58; $P > .05$), while rates for younger females remained stable over time at around 4.0 per 100 000 (average annual rate change = – 0.07; $P > .10$).

For every 1-year increase in injuries for older male motorcyclists, there was a $0.98 million increase in injury hospitalization costs ($P < .000$), which rose from $177 million in 2001 to $290 million in 2010. This translates into a 61% increase in hospitalization costs. By contrast, hospitalization costs for younger male motorcyclists did not change significantly (average annual rate change = $0.29 million; $P > .10$). As well, older male motorcyclists had significantly longer LOS, on average, than younger male motorcyclists (9.9 days versus 7.0 days; $z = 6.07$, $P < .001$).

Using the iDOT database, we compared motorcycle-related injury hospitalization rates with those for the two main causes of injury among older males: falls and motor vehicle crashes. As indicated above, while the rate of hospitalization for older males due to motorcycle crashes increased twofold from 2001 to 2010, the rate of hospitalization due to falls increased by only 6.67% (from 412.12 to 439.57; average annual rate change = 0.75; $P < .05$), and motor vehicle crash hospitalization rates decreased by more than one-third (from 77.41 to 49.35; average annual rate change = –0.98; $P < .000$).

Injury patterns were found to differ between younger and older male motorcyclists. Older male motorcyclists were significantly more likely than younger male motorcyclists to sustain an injury to a muscle/tendon/vessel, internal organ, and nerve/spinal cord, and less likely to sustain a dislocation/sprain/strain and fracture (**Table 1**). Older male motorcyclists were also significantly more likely than younger male motorcyclists to sustain a thorax injury, and less likely to sustain an upper extremity injury and an abdomen/lower back/pelvis injury (**Table 2**).

In addition, hospitalization rates for older male motorcyclist injuries from 2001 to 2010 differed by health service delivery area in BC. The highest rate was in the Kootenay-Boundary area, followed by the Northeast, North Vancouver Island, and the Okanagan areas (**Figure 2**), all more rural regions of BC.

Conclusions

Our analyses of BC injury hospitalization data indicate an increasing rate of motorcycle-related injuries

Table 2. Relative risk of injury for older male motorcyclists compared with younger male motorcyclists in BC by body region of injury, 2001 to 2010.

Body region of injury	Relative risk (95% CI)
Thorax	1.67 (1.44-1.92)
Upper extremity	0.89 (0.81-0.98)
Abdomen/lower back/pelvis	0.93 (0.78-1.10)
Head and neck	1.08 (0.95-1.23)
Hip and thigh	0.93 (0.75-1.14)
Lower extremity	0.92 (0.85-1.01)

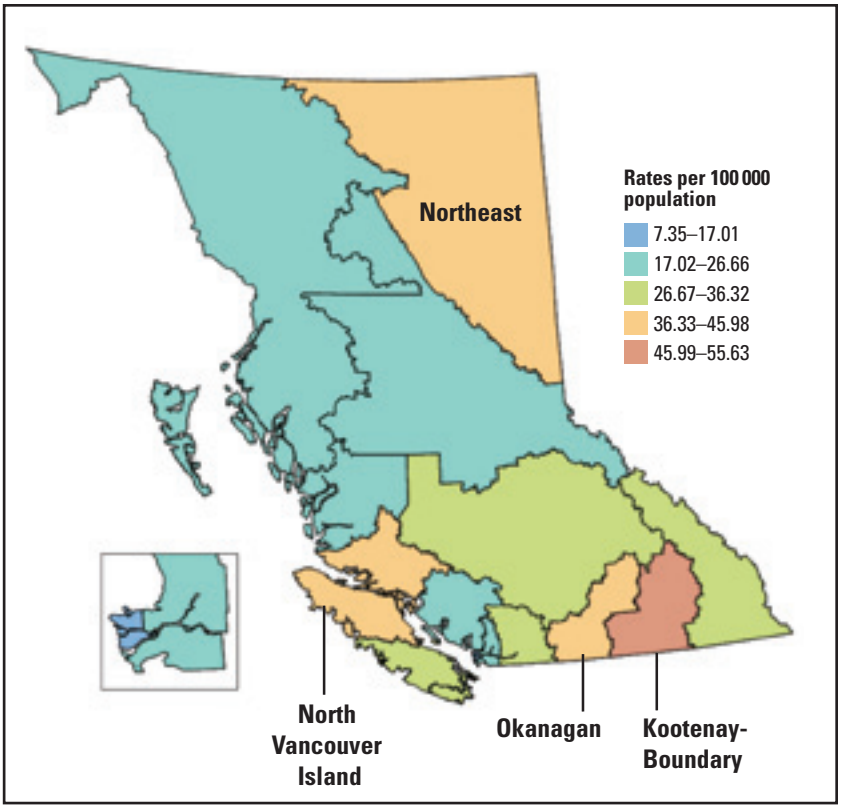

Figure 2. Four BC health service delivery areas with the highest hospitalization rates for older male motorcyclists, 2001 to 2010.

for older males at a time when motor-vehicle-related injuries decreased sharply for the same population. This trend is similar to those found in other recent studies identifying increased rates of injury among older motorcyclists,[9,10] with our analyses providing results specific to male riders.

Differences identified

When compared with younger male motorcyclists, older male motorcyclists in BC experienced longer stays in hospital and had injuries that differed by nature and body region. Like other investigations,[9] our study found that older adults had higher rates of internal organ injury but were less likely to suffer injuries such as sprains and strains. Lengthier hospital stays for older male motorcyclists may be influenced by pre-existing comorbidities and injury severity.[1] Furthermore, decisions about admission to hospital may differ for older versus younger males who experience similar types of injury.

Unlike findings in previous US research, we found older male motorcyclists in BC were not more likely than younger motorcyclists to sustain serious head injuries.[1,12] This may be due to differing helmet laws in the US, where helmet use is mandatory in only 19 states and the District of Columbia,[13] compared to Canada, where helmets are mandatory nationwide.

Whatever the reasons for the differences identified between younger and older riders, the 61% increase in hospitalization costs for older male riders in BC from 2001 to 2010 makes it important to address this emerging medical and public health concern.

Injury hotspots

The geographic differences identified in BC for older men's motorcycle injury rates merit further investigation, particularly of the injury hotspots in less urban parts of the province. Research suggests that motorcyclists age 45 and older are more likely than riders in other age groups to be injured in rural areas.[14] It is unclear whether this is related to older men in rural areas being more likely to purchase and ride motorcycles; whether older men are more likely to ride in rural areas, regardless of whether they reside in rural or urban areas; whether elements of the rural road environment increase hazards for older drivers in particular (e.g., reduced road lighting, greater distance to medical care); or whether a combination of these factors is involved.

Limitations of study

Our study did not include data on injury rates by distances traveled. It

is possible that older male motorcyclists travel more often and for longer distances than younger male riders, as reported in a US study.[15] Furthermore, we did not have data on the circumstances of the crashes, such as time of day, involvement of drugs or alcohol, use of safety equipment, weather conditions, or other information that would help us to understand trends and target safety efforts.

Prevention

Injury prevention efforts would not only reduce the rate of hospitalization for older male motorcyclists, but also reduce the growing burden on the health care system. The most recent systematic review on the effectiveness of motorcycle training programs was inconclusive and did not examine the utility of such programs for older riders in particular.[16] Trained motorcyclists were, however, more likely to wear protective gear than untrained motorcyclists.[17]

Injury prevention counseling by health care providers could inform older male patients of age-related physical and cognitive changes that can influence motorcycle driving ability. The evidence for effectiveness of injury prevention counseling comes mostly from the pediatric literature and is mixed.[18] However, promising practices have been identified, such as injury prevention counseling based on behavior change theories, suggesting the importance of developing and testing tailored safety counseling. Other options for increasing awareness of safety risks for older riders should be considered, such as targeting motorcyclists with messages through media outlets, motorcycle riding groups, or motorcycle retailers and repair shops.

The relatively recent nature of the increase in injuries among older male motorcyclists means this is an understudied phenomenon and the current status quo leaves few evidence-based options for injury prevention. Additional research is needed to identify risk factors specific to older male motorcyclists and to develop and evaluate strategies to address the emerging problem.

Competing interests

None declared.

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