Pillion Riders in New Delhi: Helmet Use and Patterns of Injury

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and
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Road Traffic Accidents (RTAs) in India

From: Road Accidents in India 2011; Government of India Ministry of Road Transport and Highways. Transport Research Wing, New Delhi

Total No. Road Accidents, Persons Killed and Persons Injured: 2002-2011

- Total No Accidents
- No. Persons Killed
- No. Persons Injured

From: Road Accidents in India 2011; Government of India Ministry of Road Transport and Highways. Transport Research Wing, New Delhi
India

One person dies from injury every 6-10 min

ACCIDENT CAPITAL OF THE WORLD 2012

By 2050, India will have the greatest number of automobiles on the planet, overtaking U.S.
The Motorized Two-Wheeler Problem

- Multi-passenger vehicles
- 70-75% of registered vehicles
- 1/3 of vehicular traffic in Delhi
- 22% of responsible vehicles in RTIs and 20-25% of fatalities/injuries
Helmet History in India

- 1984: AIIMS Helmet Data
- 1988: Motor Vehicles Act
- 1997: Delhi Implements MVA
- 1999: High Court Exemption passed
Study Design

• Survey Element: Identify attitudes towards helmet usage and contributing factors/influences among Sikh, Hindu and Muslim women
  • How does the exempted population feel about helmets?
• Observational Element: Identify actual rates of helmet usage among pillion riders in New Delhi
  • Did helmet compliance change after the Motor Vehicle Act?
• Chart Review Element: Identify injuries among male and female pillion riders, helmeted and non helmeted in RTAs
  • Does gender or helmet use affect outcomes?

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Surveying New Delhi’s Women

- Hypotheses:
  - Women oppose mandatory helmet laws
  - Helmet non-use is most commonly due to conflict with religious practice
  - Inaccurate understanding of role of helmets in RTAs
  - Media can influence helmet use
Survey Methods

Survey Administration

- Female bystanders
- 4 pedestrian areas of New Delhi
- Demographics, helmet use, MTW use, and media influence data were collected
Support for Mandatory Helmet Use by Religious Affiliation

Sikhs and Muslims less likely to support mandatory helmet laws, this was predictive of support for the law (OR 26% and 35% respectively)

- Hindu: 90%
- Muslim: 67%
- Sikh: 75%
- Other: 88%
Who Women Exempt from Helmet Law

- Majority of women DO NOT support helmet law exemptions for themselves
- Support for mandatory helmets is similar among MTW Users and Non-users

![Bar chart showing the percentages of women, Sikhs, and no one exempt from helmet law exemptions.]

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Perception of Outcomes in Head Injury

Table 3 – Believe that head injuries cause disability more often than death? (n = 299).

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>P value*</th>
<th>Odds ratio (95% CI)^1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;18–25</td>
<td>83.90%</td>
<td>16.10%</td>
<td>0.02†</td>
<td>Referent</td>
</tr>
<tr>
<td>26–35</td>
<td>74.40%</td>
<td>25.60%</td>
<td></td>
<td>0.54 (0.27, 1.09) (P = 0.09)</td>
</tr>
<tr>
<td>36–45</td>
<td>62.50%</td>
<td>37.50%</td>
<td></td>
<td>0.40 (0.17, 0.94) (P = 0.04)</td>
</tr>
<tr>
<td>&gt;45</td>
<td>65.40%</td>
<td>34.60%</td>
<td></td>
<td>0.35 (0.13, 0.85) (P = 0.04)</td>
</tr>
<tr>
<td><strong>Monthly income</strong></td>
<td></td>
<td></td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>&gt;20,000 INR</td>
<td>83.00%</td>
<td>17.10%</td>
<td></td>
<td>2.09 (1.07, 4.09) (P = 0.04)</td>
</tr>
<tr>
<td>&lt;19,999 INR</td>
<td>63.60%</td>
<td>36.40%</td>
<td></td>
<td>Referent</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>University or advanced</td>
<td>80.80%</td>
<td>19.20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>66.10%</td>
<td>33.90%</td>
<td></td>
<td>0.66 (0.31, 1.41) (P = 0.29)</td>
</tr>
<tr>
<td>No education</td>
<td>65.20%</td>
<td>34.80%</td>
<td></td>
<td>0.80 (0.28, 2.32) (P = 0.68)</td>
</tr>
</tbody>
</table>

*P values for univariate differences in believing head injuries cause disability more often than death by groups based on religion, age, monthly income, and education. Since religion was not significant at the univariate level, it was not entered in the multivariable model.

†Multivariable logistic regression likelihood ratio $\chi^2 (7, n = 277) = 21.35, P = 0.002$.

*Because at least one cell frequency was below 5, Fisher exact test P value reported.

When asked if Helmets would reduce the risk of Death in RTAs, 96.7% of women responded Yes.
Reported reasons Women who use MTWs do not use Helmets

- Discomfort/ Appearance: 46%
- No Legal Mandate: 17%
- Ineffective/ Cost Prohibitive: 16%
- Religion: 0.9%

Total MTW Users
Which Media Outlets are Influential

- TV News and Advertisements: 78.0%
- Movies: 12.1%
- Government/Schools: 3.5%
- Religion: 4.6%
Helmet Use Observation

- 1984 helmet use rate among all pillion riders: 0.6%
- Hypothesis: Male pillions will have a higher helmet use rate now than in 1984. Female pillions will not demonstrate any change.
Patterns of Helmet Use Methods

- 8 hours of video
- 4 intersections
- Data extraction with 2 reviewers
Actual Helmet Use Rates

- 1984: 3774 pillions, 0.6% helmeted
- 2011: 3868 adult pillions, 58.7% helmeted
  - Males: 2560 pillions, 88.4% helmeted
  - Females: 1308 pillions, 0.6% helmeted
Pattern of Injury Assessment

- Retrospective cohort analysis
  - nursing/physician intake document at time of event
  - reviewed intake from February 2009 until May 2011
- 3,000+ charts were then selected for:
  - MTW pillion riders
  - involved in road traffic accidents
- Data collected included
  - GCS scores, ISS scores
  - diagnoses, imaging
  - surgical procedures performed
  - length of stay, ICU admission
  - demographics
  - additional details of above as available
## Pillion Riders in RTAs

<table>
<thead>
<tr>
<th>MTW Pillion Type</th>
<th>Number</th>
<th>Percent of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helmeted Male</td>
<td>108</td>
<td>23.1%</td>
</tr>
<tr>
<td>Un-helmeted Male</td>
<td>142</td>
<td>30.3%</td>
</tr>
<tr>
<td>Helmeted Female</td>
<td>3</td>
<td>0.6%</td>
</tr>
<tr>
<td>Un-helmeted Female</td>
<td>165</td>
<td>35.3%</td>
</tr>
<tr>
<td>NR Helmet Use Male</td>
<td>20</td>
<td>4.2%</td>
</tr>
<tr>
<td>NR Helmet Use Female</td>
<td>29</td>
<td>6.2%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>467</td>
<td>100%</td>
</tr>
</tbody>
</table>
# Injury Patterns Among Pillions

## System Total (of all injuries) | Male Pillions (proportion of injuries by system) | Female Pillions (proportion of injuries by system)
--- | --- | ---
Head and Neck | 45.9% (246) | 47.1% (116) | 52.8% (130)
Face | 6.3% (34) | 70.5% (24) | 29.5% (10)
Thoracic | 3.5% (19) | 68.4% (13) | 31.5% (6)
Abdominal | 5.4% (29) | 72.4% (21) | 27.5% (8)
Extremity/MSK | 38.8% (208) | 67.3% (140) | 32.7% (68)
Total | 100% (536) | 58.5% (314) | 31.5% (222)
Head and Neck Injuries

![Frequency of Head & Neck Injury among Unhelmeted Pillions by Gender]

- Helmeted Pillions: 28.8%
- Unhelmeted Pillions: 61.2%

![Frequency of Head & Neck Injury among Unhelmeted Females by Gender]

- Unhelmeted Males: 53.5%
- Unhelmeted Females: 67.9%

Females are More Likely to Sustain a Head & Neck Injury

*Source: www.ntsinitiative.org*
Unhelmeted pillions significantly more likely to require neurosurgical intervention. No gender differential.
Injuries Resulting in Death

Frequency of Death by Helmet Status

Frequency of Death among Unhelmeted Pillions by Gender

Unhelmeted Pillions’ likelihood of Death does not significantly vary by Gender

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# Length of Stay

<table>
<thead>
<tr>
<th></th>
<th>Helmeted Males</th>
<th>Unhelmeted Females</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length of Stay in days</strong></td>
<td>8.32</td>
<td>10.47</td>
</tr>
<tr>
<td><em>t</em></td>
<td>= 0.27</td>
<td></td>
</tr>
</tbody>
</table>

No significant difference in LOS by gender among unhelmeted pillions. No difference in LOS by helmet use among male pillions.
Conclusions

• There is a mortality benefit of helmet usage in MTW RTAs, along with fewer surgical interventions utilized.

• Female pillions are more vulnerable to injury, including head and neck injuries.

• Helmet use among women would prevent a significant number of injuries and death.

• Helmet use among all pillions has increased significantly.

• Unhelmeted pillions are significantly more likely to be female.

• TV media based forms of encouraging helmet use should be utilized.
Delhi paper clip: Not wearing helmet riskier for women

The study examined over 3,000 charts of trauma patients at the capital's Jai Prakash Narayan Apex Trauma Center from April 2009 until March 2011.

WOMEN PILLION riders without helmets are more susceptible to head and neck injuries than men without helmets due to the “side-straddle” way of riding a two-wheeler, says a study published in the Journal of Surgical Research last month.

Written by Aranya Shankar | New Delhi | Published: November 22, 2016 2:50 am

Authors: Selma Marie Siddiqui and Mamta Swaroop (Northwestern University Feinberg School of Medicine), Sushma Sagar, Mahesh C Misra and Amit Gupta (AIIMS), Marie Crandall (University of Florida Jacksonville).
Future Directions

• In 2014, the Delhi Supreme Court repealed the helmet law exemption for women.
  – We are reevaluating rates of helmet use compliance and injury patterns since this law change
• Establish Public service and education campaigns on helmet use and efficacy (given awareness difference among education/income levels)
• Engage media outlets in promoting helmet compliance
• Modified protective headgear suitable for women’s needs and India’s climate
Changes in Motor Vehicles Act to make helmets compulsory for kids above 4

By Dipak K Dash, TNN | Updated: Aug 10, 2016, 04.13 PM IST

NEW DELHI: The government on Tuesday introduced amendments to the Motor Vehicles Act in Lok Sabha making it mandatory for children above 4 years to wear helmets while travelling on two-wheelers while exempting Sikhs wearing turbans from this rule.

The amendments also make it mandatory to secure a child occupant below 14 years with a safety belt or restraint system in a car. Failing to do so would attract a fine of Rs 1,000.

Considering that many drivers and pillion riders in twowheelers wear helmets only to avoid paying fine rather than for safety, the amendment specifies that the rider has to "securely fasten" the headgear.
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