Long term health and welfare effects of traffic accident Injuries

Mathew Varghese
St Stephen’s Hospital
Delhi
Injuries

Of all the causes of Years of Life Lost per year, Injury is the second most common cause after 5 years of age.

Mohan and Anderson 2001
Injuries in India

2.7 million Accidental Deaths
1.08 million Suicidal deaths
44,000 Violence related deaths

NCRB 2001
Injuries in India

Age distribution

Unlike Cancer and CAD Affects the most productive years of life

15- 44 Years 62%
45- 59 Years 20%

Affects men 3 times more than women

NCRB 2001
YEARS OF LIFE LOST IN INDIA FOR INDIVIDUALS OLDER THAN 4 YEARS

- Injury
- Cardiovascular
- Neoplasm
- Infectious & parasitic diseases

Million person years
Estimating Injury morbidity

Methodological Issues

Definition of injuries

(ICD 9) E870 – 876
E878 – 879, E930 – 949

Inter country Variations

in content, coverage, classification, definition and coding

What injury indicators?

Emergency room data, Discharge data, Selected Radiologically Verified Fractures (SRVFs), Community studies

Lyons RA et al IJICSP 2006
Injuries and disability

Population based studies on injury related disabilities are Scarce worldwide

In the medium and long term injury patients as a group were worse off

Severe head injury has worse outcomes

Dimopoulu et al  Am J Phys Med and Rehab 2004
### Injuries in India

- 8% incidence in rural areas  
  Varghese et al. 1990
- 13% in Chennai  
  Satyasekaran 1996
- 12% in Bangalore  
  Gururaj 2004
Injury vs Mortalities

<table>
<thead>
<tr>
<th>Deaths</th>
<th>Major Injuries</th>
<th>Minor Injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>1</td>
<td>30</td>
<td>70</td>
</tr>
</tbody>
</table>

Gururaj et al

Mohan et al

For every Million deaths there are 20-30 million serious injuries and 50-70 Million Minor injuries
Injury Surveillance

1 Year Pune and Bangalore surveillance

In Pune alone in one year 16,947 injuries of all 58,122 casualty attendance

Age group most commonly injured

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-24</td>
<td>29%</td>
</tr>
<tr>
<td>25-34</td>
<td>27%</td>
</tr>
<tr>
<td>35-44</td>
<td>19%</td>
</tr>
<tr>
<td>45-54</td>
<td>10%</td>
</tr>
</tbody>
</table>

Tambe MP 2007 ICMR/WHO
Injury Surveillance

Occupation of injured

- Unskilled Labourer: 31%
- Skilled Labourer: 15%
- Unemployed: 4%

Tambe MP 2007 ICMR/WHO
Distribution of diseases and injuries in different age group

- **0-4 years**
  - Fever with skin
  - Chickenpox/measles
  - Unspecified fever
  - Malaria
  - Typhoid
  - Jaundice
  - GI
  - Respiratory
  - Urinary track
  - ENT
  - MUSCLE AND JOINT
  - OTHERS

- **5-14 years**
  - Fever with skin
  - Chickenpox/measles
  - Unspecified fever
  - Malaria
  - Typhoid
  - Jaundice
  - GI
  - Respiratory
  - Urinary track
  - ENT
  - MUSCLE AND JOINT
  - OTHERS

- **15-24 years**
  - Fever with skin
  - Chickenpox/measles
  - Unspecified fever
  - Malaria
  - Typhoid
  - Jaundice
  - GI
  - Respiratory
  - Urinary track
  - ENT
  - MUSCLE AND JOINT
  - OTHERS

- **25-34 years**
  - Fever with skin
  - Chickenpox/measles
  - Unspecified fever
  - Malaria
  - Typhoid
  - Jaundice
  - GI
  - Respiratory
  - Urinary track
  - ENT
  - MUSCLE AND JOINT
  - OTHERS

- **35-44 years**
  - Fever with skin
  - Chickenpox/measles
  - Unspecified fever
  - Malaria
  - Typhoid
  - Jaundice
  - GI
  - Respiratory
  - Urinary track
  - ENT
  - MUSCLE AND JOINT
  - OTHERS

- **45-54 years**
  - Fever with skin
  - Chickenpox/measles
  - Unspecified fever
  - Malaria
  - Typhoid
  - Jaundice
  - GI
  - Respiratory
  - Urinary track
  - ENT
  - MUSCLE AND JOINT
  - OTHERS

- **55-64 years**
  - Fever with skin
  - Chickenpox/measles
  - Unspecified fever
  - Malaria
  - Typhoid
  - Jaundice
  - GI
  - Respiratory
  - Urinary track
  - ENT
  - MUSCLE AND JOINT
  - OTHERS

- **>65 years**
  - Fever with skin
  - Chickenpox/measles
  - Unspecified fever
  - Malaria
  - Typhoid
  - Jaundice
  - GI
  - Respiratory
  - Urinary track
  - ENT
  - MUSCLE AND JOINT
  - OTHERS

**Numbers**

- **0-4 years**: 2439
- **5-14 years**: 2915
- **15-24 years**: 3068
- **25-34 years**: 2057
- **35-44 years**: 1117
- **45-54 years**: 1087
- **55-64 years**: 834
- **>65 years**: 1001
<table>
<thead>
<tr>
<th>Activities when injury occurred</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Unknown</td>
</tr>
<tr>
<td>AIS 1</td>
</tr>
<tr>
<td>AIS 2</td>
</tr>
<tr>
<td>AIS 3</td>
</tr>
<tr>
<td>AIS 4</td>
</tr>
<tr>
<td>AIS 5</td>
</tr>
<tr>
<td>AIS 6</td>
</tr>
<tr>
<td>Total(%)</td>
</tr>
</tbody>
</table>
Injuries Severity and Recovery Duration: First Phase

**Injury severity**

- **Tractor** + Equipment: 2
- **Fodder cutter**: 5
- **Thresher**: 10
- **Hand tools**: 2
- **Others**: 4

**Recovery duration**

- **<7 Days**: 32
- **7-14 Days**: 16
- **14-21 Days**: 6
- **21-28 Days**: 10
- **>28 Days**: 11
- **Unknown**: 2

These charts illustrate the distribution of injuries by severity and recovery duration, categorized by equipment used.
Second Phase injuries severity and recovery duration

Injury severity

Recovery duration

Injury percentage

Tractor + Fodder cutter Thresher Hand tools Others

0% 20% 40% 60% 80% 100%

AIS 1 AIS 2 AIS 3 AIS 5 AIS 6

<7 7-14 14-21 21-28 >28 Days

0% 20% 40% 60% 80% 100%
### Incidence rates study population (Rural)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rate per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease cases</td>
<td>54557</td>
</tr>
<tr>
<td>Injury cases</td>
<td>8866</td>
</tr>
<tr>
<td>Days lost due to non injury and injury</td>
<td>842376</td>
</tr>
<tr>
<td>Deaths due to non injury and injury</td>
<td>2123</td>
</tr>
<tr>
<td>Years lost due to non injury and injury</td>
<td>39583</td>
</tr>
</tbody>
</table>
Demographic parameters in study population (Urban SSH Study)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total homes</td>
<td>242</td>
</tr>
<tr>
<td>Population</td>
<td>1871</td>
</tr>
<tr>
<td>Mean Family Size</td>
<td>7</td>
</tr>
<tr>
<td>Per Capita Income National Average</td>
<td>9545 Rs 16047Rs(2000)</td>
</tr>
<tr>
<td>Persons with per capita income less than 6000</td>
<td>64%</td>
</tr>
</tbody>
</table>
## Health statistics in the study population (Urban, SSH Study)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morbidity in recall period of 15 Days</td>
<td>9.8%</td>
</tr>
<tr>
<td>IMR</td>
<td>46.5 per 1000LB</td>
</tr>
<tr>
<td>Crude Birth Rate</td>
<td>22.9 per 1000</td>
</tr>
<tr>
<td>Persons seeking Treatment in Private Hospitals</td>
<td>78%</td>
</tr>
<tr>
<td>Accidental Injuries 2.25 % of the total morbidity for all ages</td>
<td></td>
</tr>
<tr>
<td>Per capita expenditure on treatment</td>
<td>939 Rs</td>
</tr>
</tbody>
</table>
Report from Macroeconomics of Health

(Ministry of Health, 2005)

• Public spending on Health  0.9% GDP
• Severe Illness take away 15% of Total Consumption expenditure of poorest 1/10th.
• Severe Illness take away 7.7% of Total Consumption expenditure of richest 1/10th.
• Hospitalisation Costs  35% - 66%
• Poorest rely on Borrowings and Sales of their Assets therefore vulnerable for long term poverty across generations
Report from Macroeconomics of Health

(Ministry of Health, 2005)

- Deaths due to Injuries  10% of total deaths
- Deaths direct from injuries  8,50,000
- Injuries account for  17 Million Hospns.
- Disabilities from injuries  6 million
- 2/3rd of Total injuries and disabilities due to Road traffic Injuries
- 75% of injuries occur in the  5 – 44 Yrs Age group
- Estimated Economic Loss  3 - 5% of GDP
Health burden of Road Traffic Injuries

- Head neck injuries: 78%
- Thorax injuries: 36%
- Abdomen: 23%
- Extremities: 55%

Autopsy studies Rautji 2004
Health burden of Road Traffic Injuries

- Disabilities in a Neurosurgical ward at the time of discharge:
  - 46% Severe
  - 30% Moderate
  - 24% Mild

Taly AB et al 1996
Injury Phases

Acute treatment phase

- Rehabilitation phase  Gradually improving personal capacity
- Adaptation phase    Adjusting with the environment
- Stable end situation No further change expected
International classification of Disabilities, Functioning and Health (ICF)

Disability is an overall term that includes all the negative aspects of the following four components:

Body structures (Anatomic body parts)

Body functions (Physiologic and Psychological)

Activities  Execution of tasks

Participation  Involvement in life situations
Injury impacts

Impact on the Victim

Impact on persons around the injured

Primary care givers

Family supported

Family supporting
Case History 1

Ramesh Parshad 45 year old male ran a shop of general merchandise in Assam

3 years back he went on a holiday to his native place Gorakhpur. He was on a motor cycle on the high way when he was hit from the opposite side by a truck. He sustained a fracture of the femur bone (thigh bone). He was taken to a private hospital in the neighbourhood wherein he was operated and a plate fixation of his fracture was done.
Case History 1

The fracture did not unite and the fixation plate broke.
Case History 1

Contd..

He was re-operated and an Ilizarov system was applied.
This was a cumbersome system for him. The fracture did not unite in this also. So the fixator was removed and a nail was inserted to stabilise the fracture.
Case History 1

This got infected. The nail was then removed and an antibiotic cement loaded nail was reinserted.
Two years after the injury he The fracture had not united. He was pouring pus.

He was off work. His shop remain closed. He had already incurred expenditure of up to Rs.300,000.

To raise this money he had by now sold his land (2 Bighas)
When he came to us his first request was he should be treated free as he has run out of all his financial resources. This was agreed to.

He first underwent surgery to remove all implants and clearing of pus. He was maintained on a splint and regular dressings. He was discharged after almost a month of admission. He was asked to come back six weeks after the wound heals.

He returned three months later from his village in Gorakhpur. He was crying that he did not have money to come all the way. He had to borrow money come.
He was ready for the second surgery (by now his sixth surgery from the time of injury). He said though you are treating me free it will still take a long time for my fracture to heal. ‘I cannot wait that long, please amputate my leg’. However, since his foot was good, we felt it was worthwhile trying to save his leg. We counseled him against amputation and posted him for surgery.
Case History 1

The day of surgery early morning one relative of another patient ran to my resident doctor saying that he had seen Ram Prashad go towards the staircase.

This was a fire exit stair case normally kept closed. So the resident went to investigate only to find him hanging from the railings. He raised an alarm and lifted him off the sheet improvised as a rope. He resuscitated him and he was shifted to the ICU. He was on a ventilator for the next two days. Fortunately he recovered fully in about two weeks time to become fully conscious.
Case History 1

We were in dilemma over whether to accede to his request for amputation or continue with reconstruction.

Again after counseling he agreed for a reconstruction.

He was operated again for external fixation of his fracture. He remained in the hospital for another month.

He has returned back to his village. His fracture has begun to unite. He calls up from there and sends X-rays by courier for follow-up.
Case History 1

One motor cycle crash, this man of 40

- Is off his work now for three years
- His shop is closed
- Has spent Rs.300,000 in treatment costs alone in privately.
- He has sold his land to raise his money
- Has attempted suicide once
- He is still only on his way back to recovery
Case History 2

Rural area gurgaon

Surender, 17 years, was hit and run by some vehicle and killed in May 2007

He left behind his wife, Mother and younger brother

He was a casual labourer

There was no one to support the wife. To take care of the wife the younger brother of Surender was married to the widow.
Cost benefit analysis
Good to maximise welfare but
• Difficult to estimate how one episode of fatality or injury influence the family?
• Low income families completely different from high income families
Cost Estimates

Cost calculations

– Costs to victims
– Costs to families
– Costs to Government
– Costs to insurer
– Costs to taxpayer
– Costs of property damage
Cost Estimates

Cost calculations

• Value of future life cost
  – All based on expectancy of life at birth

• What about
  – Value to Costs of Pain, Suffering, Grief
  – Costs to Loss of companionship
  – Costs to loss of quality of life
Cost Estimates

Cost calculations for non-fatal cases

- Monetisation of QALYS lost
- Analysis of Jury awards
- Survey methods (Costly)
- Multiplication of work loss by the average ratio of QALYs work loss across all non-fatal injuries
Cost Estimates

Estimates of costs of road traffic crashes in Low Income Countries (LICs)

In most low income countries there is
Lack rehabilitative services
Lack of access
Lack of employment opportunities
<table>
<thead>
<tr>
<th>Highly Industrialised</th>
<th>Less Industrialised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mostly supervised</td>
<td>Many left on their own</td>
</tr>
<tr>
<td>Not exposed to workplace hazards</td>
<td>Presence at work sites</td>
</tr>
<tr>
<td>housing better</td>
<td>Travel to work</td>
</tr>
<tr>
<td>Better play areas</td>
<td>Shanty homes</td>
</tr>
<tr>
<td>Day care facilities</td>
<td>Play on the roads</td>
</tr>
<tr>
<td>Siblings not affected</td>
<td>No day care facilities</td>
</tr>
<tr>
<td>Neglect of trauma less neglected</td>
<td>Older sibling baby sitter</td>
</tr>
<tr>
<td></td>
<td>Trauma likely to be neglected</td>
</tr>
</tbody>
</table>

TRIPP
DALY’s

- DALY’s developed as tool for assessing burden of disease
- Includes Morbidity, disability and mortality expressed in terms of estimated years of human life affected

Problems with DALY’s
- Presumes reliability of data (one disease one death)
- Second problem of deciding weights for different types of disease
- Discount rates for disability expected to occur in future

Priya R
**DALY’s**

- Multicausality has multiplier effect not additive
  - DALY’s is calculated separately for each disease
- Three major categories of illnesses Communicable, non-Communicable and injuries used with epidemiological correctness
- inherent compounding of inaccuracies

Priya R
**Health and Welfare**

- Complex societal factors influence outcome
- Relationships that are non-linear
- Need detailed prospective community-based studies to evaluate
- Only very rough estimates can be made
- Difficult to get a measurable scale applicable across communities