HEAD INJURY
EPIDEMIOLOGY, CLINICAL ASPECT & PREVENTION

A. K. Mahapatra
Prof. & Head
Department of Neurosurgery
All India Institute of Medical Sciences, New Delhi - 110029
No head injury is minor to be neglected or severe to be given up.
HEAD INJURY

- Over 5.56 million accidents occur Worldwide per year
- 1.2 million death
- 3400 death/day
- In India more than 1 million accidents per year
HEAD INJURY

- In UK 62 million people
- 150,000 people injury/year
- 15,000 severe head injury
- 4,000 die/year (Mendelow August 2002)
Head Injury in USA

- 1 Accident per minute
- 1 death every 5 minutes
- 50,000 deaths every year
- 80,000 – 90,000 lose their job
- 50-60% patients with minor head injury have problems
- 1 head injury maintaining one year cost 4 million US$
Head Injury in Germany

- 80 million
- 300-500/100000 Population
- 30,000 deaths/year
- Overall annual cost US$ 38 Billion
- 12% of all hospital cost
- In Gulf over last few year 42% rise in incidence of head injury (Oman Times, 14th April 2000)
# Head Injury in Oman

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of accidents</th>
<th>No. of Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>1975</td>
<td>1874</td>
<td>183</td>
</tr>
<tr>
<td>1995</td>
<td>11025</td>
<td>479</td>
</tr>
<tr>
<td>1999</td>
<td>8947</td>
<td>604</td>
</tr>
</tbody>
</table>
Overall incidence per 100,000 population

(a) - Urban  400-500
- Rural  300-400

(b) - Male  400-600
- Female  200-400
## Incidence from different countries

<table>
<thead>
<tr>
<th>Authors</th>
<th>Year</th>
<th>Country</th>
<th>Per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field et al</td>
<td>1976</td>
<td>UK</td>
<td>430</td>
</tr>
<tr>
<td>Jennett &amp; McMillan</td>
<td>1981</td>
<td>UK</td>
<td>270</td>
</tr>
<tr>
<td>Kraus et al</td>
<td>1984</td>
<td>San Diego, USA</td>
<td>180</td>
</tr>
<tr>
<td>Edna &amp; Cappelen</td>
<td>1986</td>
<td>Rhode Island</td>
<td>152</td>
</tr>
<tr>
<td>Countries</td>
<td>Accidents per 10,000 vehicle/year</td>
<td>Death per 10,000 vehicle/year</td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>----------------------------------</td>
<td>------------------------------</td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>3.1</td>
<td>0.39</td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>1.3</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>8.7</td>
<td>0.40</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>9.8</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>14.0</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>12.2</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>31.8</td>
<td>2.50</td>
<td></td>
</tr>
</tbody>
</table>
HEAD INJURY

DEATHS

No. of Deaths / Million accidents

<table>
<thead>
<tr>
<th>Year</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1945</td>
<td>300-400</td>
</tr>
<tr>
<td>1985</td>
<td>1000</td>
</tr>
</tbody>
</table>
HEAD INJURY

- 1 million accidents per year
- Over 100,000 death/year
- Overall, 1 accident per minute and 1 death in every 4 minutes
- Per 1 million km driven there are 6 deaths in India
- In US 1 death per 1.6 million km driven
- 100,000 accidents occurs when driver is sleeping and among them 12000 die
• 14 people die every hour in India (Times of India 24th Feb. 2010)

• In 2008 1.25 lakhs committed suicide in India

• In every hour (Times of India 24th Feb. 2010)
280 die in Indian road accidents every day

Vishwa Mohan | TNN

HEAVY TOLL

WORST 5 CITIES (Deaths In 2005)

- Delhi: 1,717
- Chennai: 1,055
- Bangalore: 835
- Mumbai: 787
- Kanpur: 598
2005 stats show TN has highest accident deaths

Vishwa Mohan | TNN

<table>
<thead>
<tr>
<th>STATES (In 2005)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamil Nadu</td>
<td>13,961</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>10,944</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>10,613</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>9,860</td>
</tr>
<tr>
<td>Karnataka</td>
<td>6,876</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>6,793</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>5,361</td>
</tr>
<tr>
<td>Gujarat</td>
<td>5,264</td>
</tr>
<tr>
<td>West Bengal</td>
<td>4,364</td>
</tr>
<tr>
<td>Haryana</td>
<td>3,282</td>
</tr>
</tbody>
</table>
HEAD INJURY

CITIES (In 2005)
- Delhi: 1,717
- Chennai: 1,055
- Bangalore: 835
- Mumbai: 787
- Kanpur: 598
- Hyderabad: 577
- Jaipur: 495
- Kolkata: 484
- Lucknow: 432
- Pune: 405

DEATH TRAPS ON ROADS

No of DEATHS in ROAD ACCIDENTS in India

2001: 80,262
2002: 84,059
2003: 84,430
2004: 91,376
2005: 98,254
2006 (Prov): 1,01,555

Types of VEHICLES

- Truck/Lorry: 22,584
- Two-wheeler: 16,145
- Bus: 12,247
- Jeep: 8,555
- Car: 7,540

AKM 09
HEAD INJURY

Overall incidence has decreased in:
- USA
- UK
- Japan
- Australia

In 10 year:
- 50% decrease of accident in Europe
- 50% increase of accident in India
HEAD INJURY

WHO 1983

• If anyone dies before age of 45 in a developed country it will be likely due to Head Injury.
• In US 1 Death per 1.6 million km driven

• In India 6 Deaths per 1 million km driven
HEAD INJURY

- Number of vehicle in India is 1% of World vehicle
- Number of accidents 16% all accidents in World
- 3% GDP
- 40% death highway
- 40% death during transport
- 20% in ward
HEAD INJURY

IN INDIA

- Number of vehicle in India has increased very much
- In Delhi, 1980, 5 lakhs vehicle, in 2006 / 5.2 million vehicle
- In 1980 Delhi’s population was 4 million, Now (2006) 16 million
- Delhi’s Vehicular population is increased by 2 lakhs every year (500 car registered in a day)

AKM 09
### HEAD INJURY IN DELHI

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Accidents</th>
<th>No. of Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>7216</td>
<td>2003</td>
</tr>
<tr>
<td>1996</td>
<td>11315</td>
<td>2286</td>
</tr>
<tr>
<td>1997</td>
<td>15584</td>
<td>2176</td>
</tr>
<tr>
<td>2001</td>
<td>8113</td>
<td>1778</td>
</tr>
<tr>
<td>2002</td>
<td>6800</td>
<td>1660</td>
</tr>
<tr>
<td>2003</td>
<td>5600</td>
<td>1173</td>
</tr>
<tr>
<td>2009</td>
<td>&gt; 15000</td>
<td>2200</td>
</tr>
</tbody>
</table>
# Head Injury in Bangalore

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Accidents</th>
<th>No. of Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>8000</td>
<td>800</td>
</tr>
<tr>
<td>2000</td>
<td>7000</td>
<td>600</td>
</tr>
</tbody>
</table>
HEAD INJURY

In Lucknow

Roads converted to Killing Mines
Hit by an irreparable loss

Times of India – 29/01/09

<table>
<thead>
<tr>
<th>Year</th>
<th>Accidents</th>
<th>Injury</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>857</td>
<td>596</td>
<td>370</td>
</tr>
<tr>
<td>2005</td>
<td>896</td>
<td>611</td>
<td>418</td>
</tr>
<tr>
<td>2006</td>
<td>913</td>
<td>875</td>
<td>446</td>
</tr>
<tr>
<td>2007</td>
<td>1237</td>
<td>847</td>
<td>490</td>
</tr>
</tbody>
</table>
Aetiology
- 70-80% road accidents
- Fall from height
- Assault
- War injury
- Domestic injury
- Natural calamities
HEAD INJURY

- In India 47000 km Highway on < 2% upto international standard.
LOWER INCIDENCE

- In female
- In children and elderly
- In rural area as compared to urban population
HEAD INJURY

- 60-70% all road accidents associated TBI
- 70% of TBI deaths occur in 24 hours
- 30-40% population in India < 20 yrs

However, 25-28% of all head injury in pediatric
HEAD INJURY

**GCS 3-15**

- **Minor**: <30 min
- **Moderate**: 30m-6 hours
- **Severe**: > 6 hours
HEAD INJURY

- On the spot management
- Management during transport
- Management in casualty
- Management by neurology
HEAD INJURY

- Golden hour
- Golden minute
- This is the time by and large lost

In UK one study 2005-2006 Neurosurgeon average time: 4-6 hours
A. Primary
   - Clot, swelling, laceration

B. Secondary
   - Ischiemia
   - Edema
   - Infarct
HEAD INJURY

- Primary damage kills - 40%
- Secondary damage kills - 60%

Secondary damage → Preventable
HEAD INJURY

1. What is the aim?
   - To save life

2. Is it possible?
   - Yes
HEAD INJURY

- How to ↓ death
- Quick resuscitate
- Quick transport
- Proper ICU care
- Early treatment
HEAD INJURY

- Primary care
- Airway
- Breathing
- Circulation

15% may have shock
BP < 90
Surgery required in 2 – 5%

- Large clot (A & B)
- Compound injury (C)
Why operate?
- To reduce ICP
- ↑ ICP reduce blood flow to brain
- ↓ Brain damage by ischaemia
Does every clot need surgery?

**NO**

- Clot → does not mean surgery
- Surgery → does not mean cure
- Surgery ↑ chance of survival
HEAD INJURY

- 30% can die without ↑ ICP
- Primary damage to brain stem
- 70% die due to ↑ ICP
HEAD INJURY

Outcome is multifactorial

- Age
- Degree of damage to brain
- Associate injury (30-50%)
- Nature of treatment
- Post op care
HEAD INJURY

- Shock is very harmful
- High blood sugar is bad
- Fever, electrolyte disturbances
- Kidney problem ↓ survival

AKM 09
HEAD INJURY

Death(%)  

- Minor 5  
- Moderate 15  
- Severe 50
In severe head injury

- 50% die
- 25% remain handicap
- 25% good outcome
HEAD INJURY

FACTORS

- Poor Road
- Old vehicle
- Vehicle without safety
- Inadequately trained driver
- Not following traffic rules
- Lack of implementation of law
(a) Road
- Poor design of road
- Poor lighting
- Inadequate traffic signals
- 1% road international standard
- Poor maintenance
(b) Vehicle
- Old vehicles poorly maintained
- No safety measures
- Polluting vehicles
- Failure of break system
(c) Driver

- Inadequate training
- Easy availability of license
- Drinking and driving
- Driver feeling sleepy
- Poor hearing or vision or colour blind
HEAD INJURY

Prevention

(1) Factors in road
(2) Problems in drivers
(3) Lack of laws
(4) Poor implementation of law
HEAD INJURY

Inadequate Legislature

- No law to enforce helmet
- Punishment of traffic violation
- Hit and run crime
- Helmet for pillion rider, bicyclist etc.
Role of Helmet

(a) Is helmet is useful?
- Yes

(b) What type of helmet?
- Ideal helmet to have lateral and mandibular protection
- Properly strapped

(c) Helmet use for pillion rider – Is a must?
Prevention of Head injury is the best cure for HI

Head injury is by and large preventable
• Do you talk while driving?
• Do you drink and drive?
## HEAD INJURY

<table>
<thead>
<tr>
<th>Offence</th>
<th>2002</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jumping red light</td>
<td>479167</td>
<td>151461</td>
</tr>
<tr>
<td>Over speeding</td>
<td>161365</td>
<td>56633</td>
</tr>
<tr>
<td>Without helmet</td>
<td>254673</td>
<td>111089</td>
</tr>
<tr>
<td>Dangerous driving</td>
<td>49574</td>
<td>17696</td>
</tr>
<tr>
<td>Not wearing seat belt</td>
<td>205453</td>
<td>100453</td>
</tr>
<tr>
<td>No driving license</td>
<td>8219</td>
<td>3769</td>
</tr>
<tr>
<td>Defective no plate</td>
<td>272000</td>
<td>112689</td>
</tr>
</tbody>
</table>

AKM 09
CONCLUSIONS

• We as public have tremendous role
• Use of safety measures are important
• Everyone must follow traffic rules
• Law must be enforced religiously
CONCLUSIONS

- TBI is in rise in developing countries
- In India it is a great public health problem
- Head injury can be prevented
- Prevention of head injury is the motto
- With everyone’s concern HI is likely come down in next decade
HEAD INJURY

THANK YOU