AN EPIDEMIOLOGICAL STUDY AMONG INJURY VICTIMS SEEKING SERVICE IN A TERTIARY CARE CENTRE IN KERALA DURING 2008-2009

Vinod Kumar B. P[1], Devi Gayathri V. K[2]

[1]Additional Professor, Department of Orthopaedics, Government Medical College, Thrissur.
[2]Managing Director, Anchal Hospital for Mother and Child, Anchal, Kollam.

ABSTRACT

BACKGROUND

Knowledge and understanding of the epidemiological profile is an essential prerequisite for analysing the public health needs in the country and to enable efficient programme planning and management. Mortality is an important indicator of the magnitude of a health problem, along with that, there are several thousand injury survivors who are left with permanent disability. These nonfatal outcomes must also be measured in order to describe accurately the burden of disease due to injury. Disability is defined as an existing difficulty in performing one or more activities with respect to the subject's age, gender and social role. The basic components of daily living are self-care, social relations and economic activity. Permanent disability such as paraplegia, quadriplegia, loss of eyesight or brain damage can deprive of an individual's ability to do these basic needs. Disabilities force the individuals to depend on others for routine physical care and economical support.

The aims of the study-

Primary Objectives- 1) To describe the pattern of injury, mechanism of injury and disability pattern among injury victims seeking a tertiary care centre service. 2) The age and gender preponderances.

Secondary Objective- To describe the mortality contributed by RTA and mechanism of injury pattern among injury victims in a tertiary care centre.

MATERIALS AND METHODS

Study Design- Both prospective and retrospective study.

Study Period- Inpatient hospital study in orthopaedic ward, Government Medical College, Trivandrum, during the period; 23/09/2008 to 21/10/2009.

RESULTS

Total persons studied=1357; injured due to fresh trauma= 820; due to sequelae of trauma and other diseases= 537; 4.4% sustained acute soft tissue injuries and the rest were bony injuries. The mortality rate was 0.12% in the one year period. 2.1% were completely cured without any disability. 97.8% had left with some disability during the one year period. 6.8% of injured returned to their original work, 41.2% can do their routine work and 41.58% cannot do even routine work who requires some assistance for their daily life. Similar to trauma, in the non-trauma conditions, there was significant male preponderance in admissions; (p value 0.001). Along with frequency, there was significant difference in disease pattern also among males and females (p value 0.001). The fatality rate following RTA varies from 7.2% during the year 2005 to 3, 2.5 and 3.5% during 2006, 2007 and 2008, respectively in a retrospective way.

CONCLUSION

The prime burden of injury victims were productive young persons. 45% of sufferers were in 31-60 yrs. age group. In the disabled group, the mean age was 39 yrs. 75% were below 48 yrs. The spectrum of injuries were fall, RTA, burns, bites of unknown animals, drowning, electrocution and hanging. 60.4% of the burden was due to fresh trauma. 1. RTA-23.65%; 2. Fall other than RTA-40.73%. The mortality rate was 0.12%, 2.1% cured and 97.8% had left with some amount of disability during the one year period, 6.8% returned to their original work, 41.2% can do their routine work, 41.58% of persons cannot do even routine work. In the disability group, the average of permanent disability was 9.7%.

KEYWORDS

Injury Epidemiology, BOD, Burden of Injury, Disability, Prevalence, Mortality, Morbidity.

HOW TO CITE THIS ARTICLE: Kumar BPV, Gayathri VKD. An epidemiological study among injury victims seeking service in a tertiary care centre in Kerala during 2008-2009. J. Evid. Based Med. Healthc. 2017; 4(48), 2917-2924. DOI: 10.18410/jebmh/2017/579

BACKGROUND

Knowledge and understanding of the epidemiological profile is an essential prerequisite for analysing the public health needs in the country and to enable efficient programme planning and management.

"A healthy population is a prerequisite for growth as much as a result of it" said by Dr. Gro Harlem Brundtland, Director General, WHO 1998-2003, on the occasion of the launch of the Report of the Commission on Macroeconomics and Health.

Financial or Other, Competing Interest: None.
Submission 12-05-2017, Peer Review 25-05-2017,
Acceptance 05-06-2017, Published 14-06-2017.
Corresponding Author:
Dr. Vinod Kumar B. P.,
Additional Professor, Department of Orthopaedics,
Government Medical College, Thrissur.
E-mail: bpvinodkumar@gmail.com
DOI: 10.18410/jebmh/2017/579

Mortality is an important indicator of the magnitude of a health problem, along with that, there are several thousand injury survivors who are left with permanent disability. These nonfatal outcomes must also be measured in order to describe accurately the burden of disease due to injury. Disability is defined as an existing difficulty in performing one or more activities with respect to the subject's age, gender and social role. The basic components of daily living are self-care, social relations and economic activity. Permanent disability such as paraplegia, quadriplegia, loss of eyesight or brain damage can deprive of an individual's ability to do these basic needs. Disabilities force the individuals to depend on others for routine physical care and economical support.

The indicator used to quantify the loss of healthy life due to disease is the disability-adjusted life year (DALYs), which includes both the mortality and the morbidity components. Murray and Lopez, 1996, identified five value choices that should be explicitly made.[1] 1. How long 'should' people in good health expect to live? This must be decided in order to calculate how many years are lost through death at any given age. How should we compare years of life lost through death with years lived with poor health or disability with various levels of severity?[2] Is a year of healthy life gained now worth more to society than a year of healthy life gained in 20 years' time?[3] Whether lost years of healthy life valued more at some ages than others? Is a year of life at young adult ages valued more than in old age or infancy?[4] Are all people equal? Should these values be determined at local or national level for national level analyses and at national or international level for cross-national comparisons?.

The patterns of disease and disability and their risk factors, the paying capacity and attitudes of people have changed dramatically in the present scenario. These factors are to be studied and reassessed in a newly comprehensive manner. A new structured study will take advantage of the opportunity to bring global researchers together to communicate and work collaboratively in an environment that is strongly seeking new burden statistics. Many studies are necessary to identify and help the people by finding out the factors required for injury control so that the mortality, morbidity and disability can be reduced or rather prevented.[5]

Duality of Disease Burden- The Asian Development Bank calls the duality in Asia's socioeconomic development since some live in poverty while others have high income. So, the opportunities for healthcare also create a similar duality in Asia's disease burden. A similar situation exists in India too. The higher income groups are led to a whole new set of disease problems in addition to those pertaining to poverty. There is an amazing rise in the incidence of non-communicable diseases also particularly injuries.[6]

Challenges in Disability- Physical pain maybe less serious, but more common problem often neglected. Injuries to ankles, knees and the cervical spine can result in chronic physical pain and limit an injured person's physical activity for lengthy periods with emotional anguish. Serious burns, contusions and lacerations can lead to emotional trauma associated with permanent disfigurement that is beyond any economic compensation.

The graded schedule of evaluation of disability serves four distinct purposes. 1. To evaluate disability under the compensation law. 2. To evaluate disability in liability cases. 3. To determine relative fitness for rehabilitation and vocational training and job. 4. To determine worthiness of treatment of deformities.

McBride scale, one of the tools to determine the permanent disability included clinical state of disability at the end of healing period when the part can be used to work. Measurement should be based on the normal for affected limb, disability for specific part and body as a whole and occupational grading of permanent disability to total body for occupation and applicable variant selected from 1 to 9. There is a rating table, which contains the occupation and the part to be assessed. The score from grades 1 to 9 are taken accordingly. Now, a new Central Government Disability Scale also came into force in India.

MATERIALS AND METHODS

Objectives of the Study

Primary Objectives-

1. To describe the pattern of injury, mechanism of injury and disability pattern among injury victims seeking a tertiary care centre service.
2. The age and gender preponderances of injury victims.

Secondary Objective-

To describe the mortality contributed by RTA and mechanism of injury pattern among injury victims in a tertiary care centre.

Methods

1. Hospital-based prospective study- To find out the pattern, sequelae and complications following injury. It also helps to describe the burden.
2. Hospital-based retrospective study- To describe the mean disability. Those persons came for disability assessment were separately seen for disability assessment. To describe the mortality contributed by RTA and causes of injury among injury victims in a tertiary care centre.

Settings- Government Medical College, Thiruvananthapuram.

Study Period- 23/09/2008 to 21/10/2009.

Study Variables-

1. Age.
2. Gender.
3. Mode of injury were classified into- 1. Fall from height; 2. RTA; 3. Trauma sequelae and other diseases.
4. Fracture sites classified as- 1. Arm; 2. Forearm; 3. Thigh; 4. Leg; 5. Spine; 6. Head; 7. Chest; 8. Others.
5. Status of the persons after injury were classified into three categories- 1. Died; 2. Recovered fully; 3. Disability.
6. Disability was classified into four categories- 1. Bed ridden; 2. Not doing routine work; 3. Can do routine work; 4. Returned to original work.

Outcome Variables

1. Death.
2. Recovery with no sequel.
3. Recovery with sequel.
4. Disability as evaluated by inability to execute.

Statistics- With the help of Microsoft Excel, Epi-Info and SPSS the data were analysed.

RESULTS

Year	RTA	Death	Total Death
2005	3274	235	
2006	3552	110	4716
2007	4647	117	5260
2008	3619	127	4802

Table 1. Hospital Data on 2005-2008

Cause	2005 Injury/Mortality		2006 Injury/Mortality		2007 Injury/Mortality		2008 Injury/Mortality	
Total Trauma Male Female	7935 5195	610 281	10236 4125	570	10285 3583	881	9698 3948	866
Injury Alone Male Female	6056 3694	330 85	8274 2664	250	8435 2427	481	7879 2484	488
Bites Male Female	1079 588	10 6	963 530	16 12 4	746 369	11	777 415	15
Burns Male Female	111 148	31 92	92 156		111 185		154 167	139
Drowning Male Female	7 4		9 7		18 14		16 8	6
Electrocution Male Female	26 4	1	26 7		13 4		16 12	
Hanging Male Female			80 41		101 185			

Table 2. Mechanism of Injury and Mortality 2005-2008

Results of the Prospective Study

1	Total No of Male Patients	569	820							
2	Total No of Female Patients	251								
	Age Limit	Total	Male	Female	Fall From Height	Male	Female	RTA	Male	Female
3	0-10	36	21	15	21	13	8	5	2	3
4	11-20	88	81	7	31	29	2	24	22	2
5	21-30	171	148	23	41	30	11	53	51	2
6	31-40	161	120	41	59	41	18	41	33	8
7	41-50	134	94	40	50	26	24	29	23	6
8	51-60	96	56	40	48	21	27	22	18	4
9	61-70	71	29	42	38	11	27	11	5	6
10	71-80	49	15	34	36	9	27	9	5	4
11	81-90	12	4	8	9	4	5	0	0	0
12	91-100	2	1	1	1	0	1	0	0	0

Table 3. Age Distribution of Mechanism of Injury among Male and Female Victims

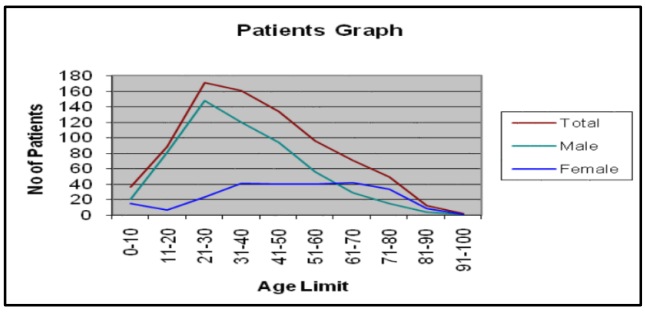


Figure 1. Age Distribution of Male and Female Injury Victims

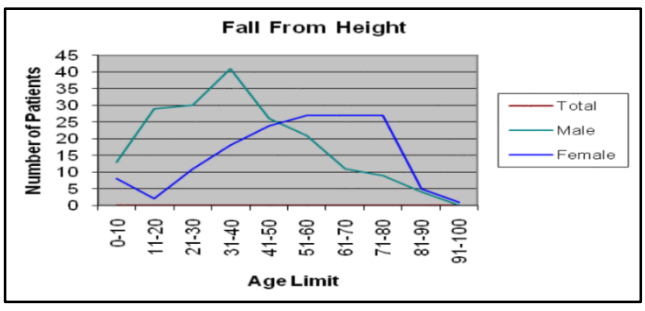


Figure 2. Age Distribution of Male and Female Victims Due to Fall

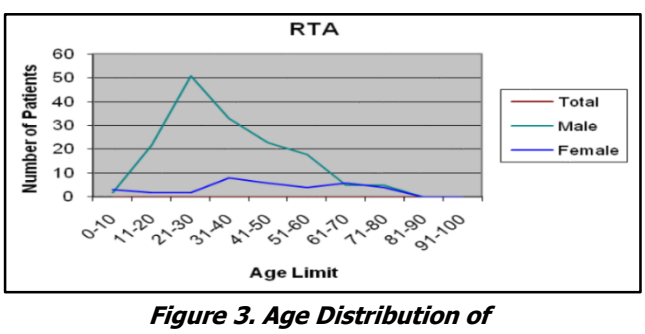


Figure 3. Age Distribution of Road Traffic Accident Victims

The frequency description of the body parts involved in trauma.

	Total Injuries=310	
Shoulder and arm	62	20%
Elbow	24	7.8%
Forearm	175	56%
Wrist and hand	49	15.8%

Table 4. Upper Limb Injuries

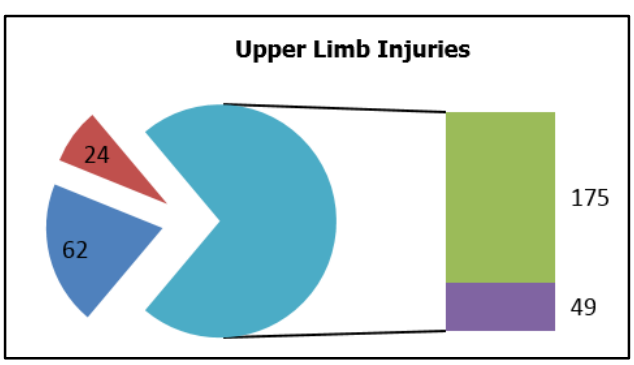


Figure 4. Upper Limb Injuries

		Total=459
Femur	194	45%
Leg	135	29.80%
Ankle	62	13.70%
Knee	61	13.50%
Hip	7	1.50%

Table 5. Lower Limb Injuries

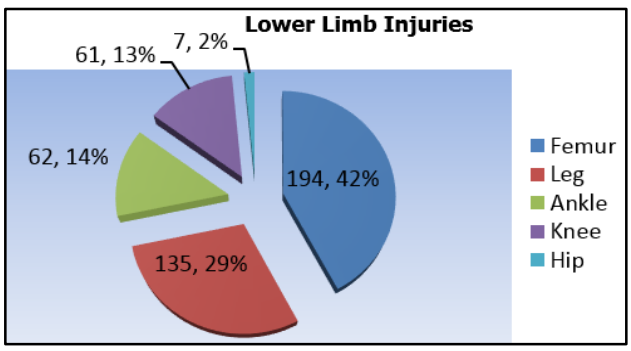


Figure 5. Lower Limb Injuries

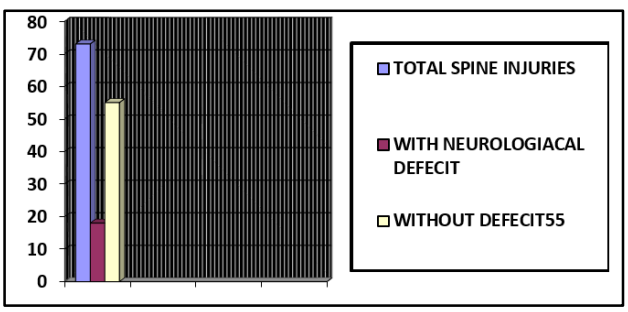


Figure 6. Spine Injury Frequency

Total=73 (9%) 18 with deficit and 55 without deficit.

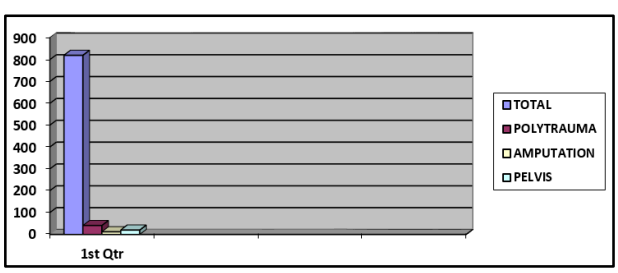


Figure 7. Prevalence of Polytrauma-41 (5%)

Amputation-12; pelvic injury-20 (2.4%).

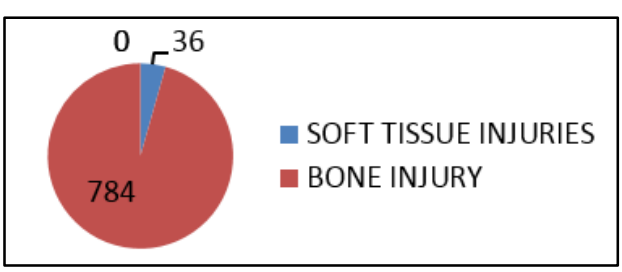


Figure 8. Prevalence of Soft Tissue Injury

Total=820; bony injuries=784; soft tissue injuries alone=36.

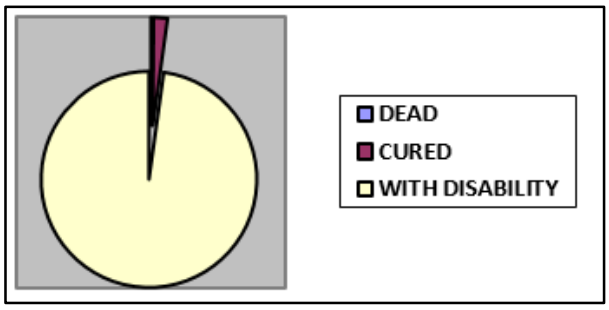


Figure 9. Outcome of Injury

Total=820; died=1; cured=17; with disability=802.

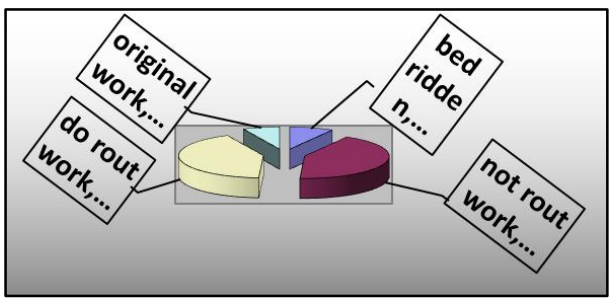


Figure 10. Disability Following Injury

1. Bed ridden=67; 2. Not doing routine work=341; 3. Can do routine work=338; 4. Returned to original work=56.

Diagnosis	Frequency	Percentage
Pain syndrome, congenital dislocation	103	19.2
Tumours	35	6.5
Deformity	74	13.8
Post-trauma complications	237	44.1
Infection	88	16.4
Total	**537**	**100.0**

Table 6. Profile of Late Trauma Complications and Other Diseases Frequency

Age	Frequency	Percentage
<16	148	27.6
16-30	111	20.7
31-60	239	44.5
>60	39	7.3
Total	**537**	**100.0**

Table 7. Stratified Age Distribution (Age in Yrs.)

Mean=31.7 yrs. (0 to 85 yrs.); median=32 yrs.

Sex	Frequency	Percent
Male	387	72.1
Female	150	27.9
Total	**537**	**100.0**

x^2=21.083; df=3; p=0.001.

	Male		Female		Total	
Diagnosis	**N**	**%**	**N**	**%**	**N**	**%**
Pain syndrome, cog dislocation	58	15.0	45	30.0	103	19.2
Tumours	26	6.7	9	6.0	35	6.5

	Male		Female		Total	
Age	**N**	**%**	**N**	**%**	**N**	**%**
<16	91	23.5	57	38.0	148	27.6
16-30	96	24.8	15	10.0	111	20.7
31-60	175	45.2	64	42.7	239	44.5
>60	25	6.5	14	9.3	39	7.3
Total	**387**	**100.0**	**150**	**100.0**	**537**	**100.0**

Table 8. Gender Distribution

Deformity	51	13.2	23	15.3	74	13.8
Post-trauma complications	192	49.6	45	30.0	237	44.1
Infection	60	15.5	28	18.7	88	16.4
Total	**387**	**100.0**	**150**	**100.0**	**537**	**100**

Table 9. Frequency of Diseases by Gender

x^2=23.234; df=4; p=0.001.

Hospital study- Disability group analysis.

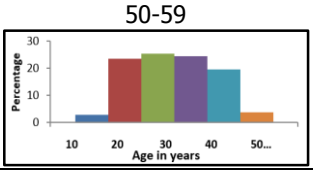
Age	Frequency	Percentage
<20	3	2.9
20-29	24	23.5
30-39	26	25.5
40-49	25	24.5
50-59	20	19.6
		
>60	4	3.9
Total	**102**	**100.0**

Table 10. Age Distribution

SEX	Frequency	Percent
Male	87	85.3
Female	15	14.7
Total	102	100.0

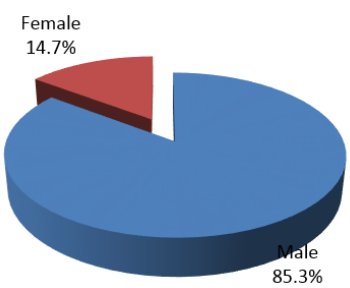


Figure 11. Male-Female Ratio

Figure 12. Job Distribution of Injured

N=102	Age	Temporary Disability (Wks.)	Permanent Disability (%)
Mean	38.8	16.6	9.7
sd	11.9	11.6	6.5
Minimum	10	2	2
Q1	29	10	5

Median	39	12	7
Q3	48	19	12
Maximum	69	72	40

Table. 11. Disability Assessment

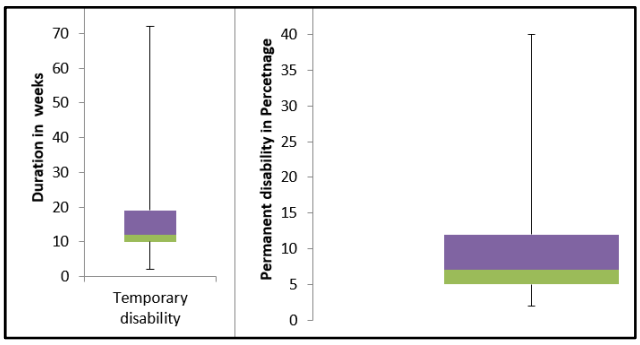


Figure 13. Disability Assessment

DISCUSSION

World Health Organisation works with governmental and nongovernmental agencies to make the profile of injuries around the world, which says that 3400 people die on the roads everyday including children, pedestrians, cyclists and elderly people. Worldwide, nearly 1.2 million deaths occur due to RTA every year and 50 million gets injured. Three-quarter of all RTAs occur in individuals aged between 15-45 years and were predominantly men. Additionally, for every death, nearly 20-30 people were likely to be hospitalised also.

Inpatient hospital study in orthopaedic ward during the period- 23/09/2008 to 21/10/2009 shows-

Total persons studied=1357.

Reason for admission-

1. Injured due to fresh trauma= 820.
2. Due to sequelae of trauma and other diseases= 537.

The data (2005 to 2008) from Medical College, Trivandrum, were analysed showed the following results. 13,130 people were admitted following trauma during the year 2005. This was 14,361 in 2006; 13,868 in 2007 and 13,646 in 2008. Fall and RTA alone constituted 74.25%, 76.16%, 78.36% and 75.94% of total injuries during these years. So, the major preventable cause, which contributed to the burden of injury was road traffic accidents. Governmental agencies taken this point as serious as infectious diseases and that leads to policy decisions like ban of liquor and suspension of driving licenses if one do violation of traffic rules. Bites by unknown creature accounted for 12.69% in 2005; 10.39% in 2006; 8.04% in 2007 and 8.73% in 2008. The mortality rate was 0.9%, 1%, 0.9% and 1.25% during these years. Burns accounted for 1.97%, 1.72%, 2.13% and 2.35% among injury victims during the year 2005, 2006, 2007 and 2008, respectively. The mortality rate was 4.74% during 2005 and 4.3% during 2008. Drowning were 11, 16, 32 and 24 in number during 2005, 2006, 2007 and 2008, respectively. Drowning were more in males 7, 9, 18 and 16 cases during these years. Electrocutions came around 30, 33, 17 and 28 in number during the above years, respectively. Hanging constituted 0.9% of the total injury with a male predominance (male-to-female ratio 2:1) during 2006 and 2.06% with a female predominance (male-to-female ratio 0.54:1) during the year 2007. The table 3 shows the age, gender distribution along with the mechanism of injury among hospitalised persons in Medical College, Trivandrum.

Hospital retrospective study shows the fatality rate following RTA varies from 7.2% during the year 2005 to 3, 2.5 and 3.5% during 2006, 2007 and 2008, respectively. There was a marked reduction in fatality due to RTA from 2005 and the rest of the years. When the total deaths considered the mortality contributed by RTA varies from 2.3%, 2.2 and 2.6% during 2006, 2007 and 2008, respectively. The frequency of mechanism of injury were described in Table 8.

Type of Injury	2005	2006	2007	2008
Total trauma (in numbers)	13,130	14,361	13,868	13,646
Injury alone (RTA, fall)	74.25%	76.16%	78.33%	75.94%
Bites by unknown creature	12.7%	10.4%	8%	8.73%
Burns	2%	1.72%	2.13%	2.35%
Drowning	0.08%	0.1%	0.23%	0.17%
Electrocution	0.22%	0.22%	0.12%	0.20%
Hanging		0.84%	2.06%	

Table 12. Mode of Injury- A Hospital Survey

The prospective study- Patients who came to the medical college hospital for the selected period of 13 months on all Mondays and alternate Fridays were (Ortho-1 unit) analysed in detail and followed up. It showed 1357 patients came to the department, of these 820 cases with a male-female ratio of 2.26:1 were fresh trauma cases, 334 (40.73%) sustained injuries following fall from height with male-to-female ratio being 1.23:1; 194 (23.65%) sustained RTA (male-to-female ratio 4.5:1). Males were more prone to get injury particularly RTA, which was similar to the different community statistics. Similarly, one-third was due to other injuries, i.e. 292 (35.60%) were other trauma injuries, which includes fall at home, violence, etc. 537 cases were of old orthopaedic problems including late trauma complications, tumours, infections and degenerative disorders, etc. Injuries following fall were more in younger males because they took part in construction work and tree climbing more than others. Older females were more prone to injury following a fall. There was no difference in age group preference for females in contracting RTA when comparing males.

68.5% of total cases were at the age group of 21 to 60; particularly working class population, so the economic loss due to injury maybe very high (male-to-female ratio was 2.9:1). 15% were less than 20 yrs. and 16.4% were more than 60 yrs., which was more than the community average; this may be due to the selective nature of hospital admissions. Females having more than 60 yrs. of age contracts injuries more frequently (the male-to-female

ratio=0.57:1). This may be due to more life expectancy of females and increased frequency of history of fall at home among them.

Type of Injury- 4.4% sustained acute soft tissue injuries and the rest were bony injuries. 5% of the trauma victims were sufferers of polytrauma who needed specialised care with multispeciality approach causing economic burden to the government and community. 12% of them lost their limb and 2.4% had pelvic injuries. 9% of the victims had spine injury, which as such causes high morbidity. Of the total 73 spinal injuries, 55 of them had no neurological deficit and so with good prognosis and 18 had neurological deficit having bad prognosis. Those with neurological deficit needs more prolonged hospital stay, rehabilitation and they usually have permanent disability, so also high treatment cost. A spinal injury with neurological deficit may need surgery and often warrants the service of a reliable bystander to look after them. This is the reason why they are considered to be an economical burden to the society compounding direct, indirect and intangible costs. There should be some economical support from the government side for these victims since they have become permanently jobless and more over those persons looking after them also become jobless. 7% of the total had combination of fractures. The extremity injury was common, this was the same situation in many studies conducted across the world. Of the total 820, 459 had lower limb injuries and 310 had upper limb injuries, this included combination of injuries also. The mortality was 1 in 820. 2.1% were completely cured without any disability. 97.8% had left with some disability during the one year period. The high disability rate attributed to the selective admission of 'severe cases' to a tertiary care centre; which differs significantly from the community statistics. 6.8% of injured returned to their original work, 41.2% can do their routine work and 41.58% cannot do even routine work who requires some assistance for their daily life.

The rest of 537 admissions were under the 'cold orthopaedic category'. 44.1% late trauma complications like nonunion, malunion, stiffness, re-surgeries, avascular necrosis, etc.; 6.5% bone tumours. 16.4% suffered bone and joint infections emphasising the prime importance of infection control in day-to-day management of hospitals. Males were more vulnerable to get infection than females, the ratio being 2.58:1. Because of the direct admission of tumour cases to the Regional Cancer Centre, Trivandrum; it showed a less frequency in our ward admissions and also the most common bone tumour, multiple myeloma usually admitted in Haematology Department. The mean age of a sufferer was 32 yrs. 45% were in the 31-60 yrs. of age group, which was inconsistent with the population statistics. Male population comes around 72%. Of the total, people with less than 16 yrs. account for 28% and more than 60 yrs. 7.3%.

Assessment of Disability

Disability was assessed on a group of injury victims who came for disability assessment in Mondays and alternate Fridays in outpatient clinic particularly following RTA with the order of court of law. Based on the McBride scale, the disability percentage was assessed. Because of this selection procedure, the study gets a weightage of random sampling from a huge group of persons having accident disability.

Total 102 persons came for the disability assessment during the 13 months period of study. The mean age was 39 yrs. 75% were below 48 yrs. 70% were between 30 and 60 yrs., which is in accordance with the world literature stating that the most vulnerable community was male aged between 30 to 60 yrs. Persons with less than 20 yrs. and more than 60 yrs. were very minimal. Persons in 20-29 yrs. age group were also almost 23.5%. So, the working class population were more involved in the tragedy of trauma. The male-to-female ratio was 5.8:1; a little more when comparing to the community ratio of the injured. This may be because the quantum of burden by RTAs burden were more in males comparing to other type of injuries especially fall at home.

Job category of the injured- Manual labourers, which were around 66.66%; then drivers nearly 15.68%, next to it were those doing house job up to 10.78%; mostly females and 6.8% were government employees. The manual labourers who are the sole breadwinners of their family were the most sufferers. Most of the manual labourers get their wages on a daily basis, and if they don't work for one day, they will not get any salary. This is a pathetic situation leading to economic and social in-security among the victims. Some amount of governmental interventions for their rehabilitation is mandatory. On assessing their disability period, the mean duration of temporary disability was 17 weeks, a minimum of 2 weeks to maximum of 72 weeks. All the people who came for disability were left with some amount of permanent disability in the rest of their life for an average of 9.7%. According to McBride scale, a minimum of 2% to maximum of 40%.

Future Scope- A long-term prospective study to find out the DALY.

Public Health Importance-

1. This data will help in allocations of fund to buy implants and medicines knowing the frequency of injuries.
2. The frequency directs hospital authorities to allot beds and wards to different groups of people.
3. In Trivandrum Medical College, a separate orthopaedic ICU was stated to manage the polytrauma, spine and pelvic injury victims.

CONCLUSION

1. The prime burden of injury victims were productive young persons. 45% of sufferers were in 31-60 yrs. age group, 68.5% were in the age group of 21 to 60 yrs., 16.34% were 60 yrs. and above while 15.12% less than 20 yrs. Among the orthopaedic conditions other than

2. acute injury sufferers, the mean age was 32 yrs. less than 16 yrs. account for 27.6% and more than 60 yrs. 7.3% of all injuries. In the disabled group, the mean age was 39 yrs. 75% were below 48 yrs.
3. The spectrum of injuries were fall, RTA, burns, bites of unknown animals, drowning, electrocution and hanging. 60.4% of the burden was due to fresh trauma.
   1. RTA- 23.65%; 2. Fall from height- 40.73%; 3. Others- 35.60.

   The other bone diseases constituted bone tumours- 6.5% and infection 16.4%.

   In the disabled group, the job pattern were 66.66% manual labourers, 15.68% drivers, 10.78% doing house job and 6.8% government employees.
4. Outcome pattern- Only 2.1% cured and 97.8% had left with some amount of disability during the one year period, 6.8% returned to their original work, 41.2% can do their routine work and 41.58% of persons cannot do even routine work.
5. In the disability group, the mean duration of temporary disability was 17 weeks (2 weeks-72 weeks). The average of permanent disability was 9.7% (2%-40%) was there in the rest of their life span.

REFERENCES

[1] Mohan D. The road ahead: traffic injuries and fatalities in India. Transportation research and injury prevention program. Delhi: IIT 2004.
[2] Baker SP, O'Neill B, Karpf RS, et al. The injury fact book. USA: Insurance Institute for Highway Safety 1984:p. 313.
[3] Mock. Guidelines for essential trauma care. WHO 2004. who.int/violence/publications/services.
[4] Gururaj G. Injuries in India: a national perspective. Burden of disease in India. National commission on macroeconomics & health. Ministry of health & family welfare. Government of India 2005:325-347.
[5] Murray CJL, Lopez AD, Mather CD, et al. The global burden of disease 2000 project. Geneva: (Revised) WHO 2001:p. 36.
[6] Australian burden of disease and injury study. 1998.