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Research Article

A cross sectional study of pattern of injuries and its socio-economic impact in an urban area, Bangalore

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ABSTRACT

Background: India is facing the dual problem of communicable and non-communicable diseases (NCD). Among NCD; injuries is a major public health problem resulting in major socio-economic impact and data regarding this is inadequate. Hence present study was undertaken with an objective to study the patterns of injuries and its socio-economic impact on individual and the family in an urban area.
Methods: Cross sectional study was conducted covering 3003 population by house-house survey. Pre-tested, semi-structured questionnaire was used. Among injured further injury details was obtained.
Results: Prevalence of injuries was 4.93% (95% CI 4.1 to 5.7). Median (IQR) age of injured was 25.5 (12.25-40.75) years. Injuries among 15-59 years were 65.3% and among males were high 66.9%. Based upon external cause, falls was the commonest. Lower limb was common injury site and 46.6% were of severe injuries. Median number of working days lost by injured and by care giver and number of days taken by the injured person to return back to routine activities differed significantly between moderate and severely injured persons. Average amount of direct and indirect expenditure per injury was Rs. 14826 and Rs. 16737 respectively.
Conclusions: Injury prevalence was 4.93%; Commonest type of injuries was falls and road traffic injuries. More severe the injury; higher was the socio-economic impact.

Keywords: Injuries, Road traffic injuries, Falls, Socio-economic impact, Urban area

INTRODUCTION

In the 21st century as a result of epidemiological transition, India is witnessing a rise in the morbidity & mortality due to non-communicable diseases and injuries. Injuries are one of the leading causes of death both in developed and developing countries. Since time immemorial, injuries were a part of the human race but presently due to various factors like rapid urbanization, mechanization, industrialization and increased vehicular use, there is increase in number and also severity of injuries.

Globally about 5.8 million people die each year as a result of injuries which accounts for 10% of the world's deaths, 32% more than the number of fatalities that result from malaria, tuberculosis, and HIV/AIDS combined.[1] Studies done so far infer that people in the age group of 15-44 years are at increased risk of getting injured and are more common in males.[2] But injuries can affect anyone, irrespective of age and gender either at home or at work place or on a road or highway or at institutions.

Currently not many studies have been undertaken to ascertain the burden of the injuries and their socio-economic impact. Most of the injuries are either not

reported or under-reported (especially intentional injuries) and misclassified due to difficulties in understanding causes of injuries.[3]

Hospital based studies may give an idea of only the severe cases or of those injuries which need medical assistance resulting in underestimation of the exact burden of the disease.[3] By carrying out a community based studies one can get detailed information on all types of injuries regardless of treatment sought. Hence a community based study had been envisaged.

With the help of reliable data on the nature and extent of injury, one can quantify the magnitude of the problem; identify risks and possible protective factors; develop and monitor intervention programs. Keeping the above issues in mind the present study was designed with an objective to assess the pattern of injuries prevalent in two wards of Bruhat Bengaluru Mahanagara Palika (BBMP) i.e Ward 17 & Ward 36, Bangalore and also to determine socio-economic impact of injuries on the individual and their family.

METHODS

A cross sectional study was conducted during June 2012-March 2013 in two wards of BBMP i.e. ward number 17 & 36, Mattikere which is an urban field practice area of a tertiary care hospital. Study population included all permanent residents of ward number 17 & 36, Mattikere, Bangalore. Inclusion criteria consisted of all the individuals who were residing in that area from the past 6 months and those who met with injury where the term "injury" is described.[3] Further the injuries were classified as mild injuries (defined as any injury resulting in partial or complete incapacitation of the injured person lasting for less than 48 hours in the past 3 months); moderate injuries (defined as any injury resulting in partial or complete incapacitation of the injured person lasting from 3rd day to 13 days in the past 12 months) and severe injuries (defined as any injury resulting in partial or complete incapacitation of the injured person lasting ≥14 days (≥2 weeks) or resulting in permanent disability/coma/death in the past 12 months). Recall period of 12 months was used during data collection. Those who were not willing to participate for their own reasons were excluded.

Sample size was calculated by applying the injury incidence rate to be 10% in urban area[4] with absolute precision of 1.1% and at 95% desired confidence level. It was estimated that 2857 persons need to be included in the study. However it was proposed to cover 3000 persons (assuming 5% as non-response) and totally 3003 persons were covered. Sampling methodology employed has been explained in Figure 1. Multi stage sampling technique was applied. The Mattikere health centre catered to health needs of people residing in ward 17 & 36 which had population of 49936 & 37323 respectively accounting to total population 87259 in both wards. Each of these wards had been further subdivided into Census Enumeration Blocks (CEB of 2011 Census data) with an approximate of 125-150 households with a population of 800 in each CEB as per Census Commissioner of India.[5] Based on the population proportion to size; 12 & 8 CEBs was selected randomly using the table of random numbers from ward 17 & 36 respectively. In each CEB the first house was selected randomly & from their complete enumeration of the adjacent houses was conducted till 150 people were met. In each house either the head of the family or any person (aged >18 years and well informed about their family) was approached. Initial demographic details name, age in completed years, sex, education, occupation and total monthly income was collected after taking the informed consent. Socio-economic status was computed. Screening questions administered were in the past one year has any member of your family died due to injury? Or in the past one year has any member of your family hospitalized at least for one day due to an injury? Or in the past one year has any member of your family is in regular touch with health care (follow up of three or more times) due to an injury? If yes to any one of the three screening questions further questions regarding injury details, economic & social impact was collected with the help of pre-tested semi-structured questionnaire. Social impact of the injury was assessed by number of working days lost by the injured & caregiver, time taken by the injured to return back to normal routine activities and by number of days care giver's activity was disrupted. It was also assessed in terms of family break up, education loss, employment opportunity and disability. To assess economic impact details of direct and indirect expenditure was collected. Direct expenditure included the expenses incurred due to hospital charges, travel of patients, legal charges, funeral charges and other miscellaneous charges. Indirect expenditure was mainly assessed through the wages lost by the injured and also the caregiver. Relevant records were cross checked to correlate with the information given by the injured person; ex: prescriptions, X-rays, discharge summaries or local examination of the injury site.

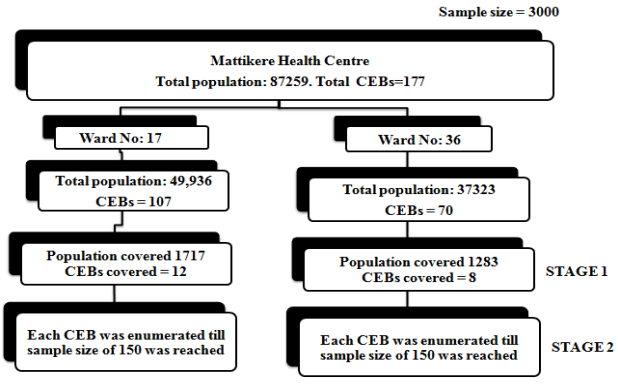

Figure 1: Multi stage sampling.

From the pilot study it was observed that mild injuries had minimal social & economic impact. Hence information relating to moderate & severe injuries was alone collected in each of the households.

Statistical analysis

The data was tabulated according to various types of injuries along with their percentage distribution and prevalence rate with 95% confidence interval was calculated for different patterns of injuries. Qualitative variables were expressed in frequency and percentages. The quantitative data were summarized through descriptive measures such as mean, standard deviation, median and inter quartile range. Mann Whitney U test, chi square test and Fisher exact test were employed for evaluating statistical significance.

Ethical clearance was obtained for conducting the study from the institutional Ethical Committee. During the survey, informed consent was taken from all the individuals who provided information.

RESULTS

Information was collected from 745 households covering total population of 3003 from two wards. Results are discussed under the headings of socio-demographic details, pattern of injuries, socio-economic impact of injuries on the individual and on their family.

Socio-demographic details

Out of the 3003 population surveyed; 69.6% were in the age group of 15 to 59 years; mean age (SD) of surveyed population was 31.6 (18.7) years and median age was 30 years (IQR 18-45). Males accounted for 51.1% of the population covered. It was found that 44.5% and 25.2% belonged to upper middle and lower middle socio-economic status respectively according to modified Kuppuswamy's classification of socioeconomic status[6] and 84.5% belonged to Hindu religion (Table 1).

Out of 3003 population; 144 (4.8% (95% CI: 4.02 - 5.6)) subjects met with moderate or severe injuries; out of which 140 (97.2%) had only one injury event while 4 (2.8%) people met with injury twice in the last one year recall period. The average number of injuries per person was (148/144) 1.03 and total number of moderate to severe injuries in our study was 148 out of 3003 population covered i.e. 4.93%.

The mean (SD) and median age among those injured was 28.6 (18.3) years & 25.5years (IQR 12.25-40.75 years) respectively. The prevalence of injuries among children ≤14 years was highest and was statistically significant (P = 0.01), similarly prevalence of injuries among males was high and statistically significant (P<0.01) (Table 1).

Table 1: Prevalence of injuries (%) according to various socio-demographic characteristics.

Variables	Groups	Population at risk	Number injured*	Prevalence per 100 population (95% CI)	χ^2 value (P value)
Age (years)	≤14	620	42	6.6 (5.7-7.5)	8.48 (0.01)
	15-59	2089	94	4.5 (3.7-5.3)	
	≥60	294	8	2.7 (2.1-3.3)	
Gender	Male	1533	96	6.3 (5.4-7.9)	14.63 (<0.01)
	Female	1466	48	3.1 (2.5-3.7)	
	Transgender	4	0	0	
Socio-economic status	Upper	362	17	4.7 (3.3-5.5)	1.99 (0.74)
	Upper middle	1335	58	4.3 (3.5-5.0)	
	Lower middle	757	43	5.7 (4.9-6.6)	
	Upper lower	521	25	4.8 (4.1-5.6)	
	Lower	28	1	3.6 (2.3- 4.3)	
Religion	Hindu	2539	122	4.8 (4.1-5.6)	1.17 (0.56)
	Muslim	309	17	5.5 (4.7-6.3)	
	Christian	155	5	3.2 (2.6-3.9)	
Total (N)	All	3003	144	4.8 (4.0-5.6)	

CI- confidence interval. *Number injured during 12 months of recall period

Table 2: Distribution and prevalence rates (per 1000 population) of injuries by physical nature and other characteristics.

Physical nature of injury	n* (%)	Prevalence per 1000 population (95% CI)
A) By physical nature of injury		
Fracture	23 (15.5)	7.7 (4.6-10.1)
Sprain/strain	23 (15.5)	7.7 (4.6-10.1)
Dislocation	4 (2.7)	1.3 (-0.01-2.6)
Cuts or open wound	77 (52)	25.6 (19.8-31.4)
Bites	9 (6.1)	2.3 (0.6-4.1)
Concussion	3 (2.0)	1 (-0.15-2.2)
Organ system injury	2 (1.4)	0.6 (-0.3-1.5)
Burns	7 (4.7)	2.3 (0.6-4.1)
B) By external cause of injury		
Road traffic injuries	41 (27.7)	13.7 (9.5-18)
Fall	58 (39.2)	19.3 (14.3-24.3)
Fall of object	15 (10.1)	5 (2.4-7.6)
Domestic accidents	2 (1.4)	0.7 (-0.3-1.7)
Occupational	6 (4.1)	2 (0.4-3.6)
Animal related injury	14 (9.5)	4.7 (2.2-7.2)
Physical assault	5 (3.4)	1.7 (0.2-3.2)
Suicide	1 (0.7)	0.3 (-0.3-0.9)
Burn	6 (4.1)	2 (0.36-3.6)
C) By anatomical location of injury		
Head and neck	35 (23.6)	11.7 (7.8-15.6)
Chest, scapular region, trunk anterior & posterior; genital area and spine	10 (6.8)	3.3 (1.2-5.4)
Upper limb	37 (25)	12.3 (8.3-16.3)
Lower limb	62 (41.9)	20.7 (15.5-26)
Multiple sites	4 (2.7)	1.3 (-0.02-2.6)
D) By place of injury		
Street/highway	66 (44.6)	22.0 (16.7-27.4)
Home	43 (29.1)	14.3 (10-18.6)
Others (sports, industries, farm, commercial area, country side)	16 (10.8)	5.3 (2.7-8)
Work area	14 (9.5)	4.7 (2.2-7.2)
School	9 (6.1)	3.0 (1-5)
E) Based on the intention of injury		
Unintentional	142 (95.9)	47.3 (39.6-55.05)
Intentional	6 (4.1)	2.0 (0.4-3.6)
F) By severity of injury		
Moderate	79 (53.4)	26.3 (20.5-32.14)
Severe	69 (46.6)	23 (17.5-28.5)
Total	**148 (100)**	**49.3 (41.4-57.2)**

CI- confidence interval. *Number of injury cases during 12 months of recall period

Pattern of injuries

Based upon the physical nature of injury 52% injuries were due to cuts or open wound followed by fracture 15.5%. Prevalence rates for cuts or open wounds were high. The proportion of falls 39.2% and its prevalence rate 19.3 (14.3-24.3)/1000 population was the highest followed by road traffic injuries based upon the external cause of injuries. Lower limb 41.9% and upper limb 25% were the most common sites for injury. It is observed that majority of the injuries occurred on the street or highway (44.6%) followed by home (29.1%). Based on the severity 46.6% were of severe injuries. Based on the intention of injury 95.9% injuries were of unintentional type (Table 2). Of the 6 intentional injuries, physical assault 3 (49.9%) was most common followed by one (16.7%) animal related injury, one (16.7%) road traffic injury and one suicide (16.7%).

Table 3: Social impact of injuries on the individual and on their family.

Number of days: (n)	Median (IQR) days lost for		P value*
	Moderate injuries	severe injuries	
Lost in work place or school missed by injured person (85)	7 (4-7.5)	30 (11.25-45)	<0.001
Lost by care giver if employed (37)	2 (2-3)	5 (2-14)	0.017
Injured person returned back to their normal routine activities following days (139)	7.5 (5.5-14)	45 (21-90)	<0.001
Care giver's activity disrupted for days (74)	3 (2-7)	14 (4-30)	<0.001

IQR= Inter Quartile Range; *Mann Whitney U test

Social impact of injuries

It was observed that 85 people were absent from their work place or school (in case of children who were studying) following the injury. The median values of number of working days lost or school missed differed significantly b/w moderate and severely injured persons and this was found to be statistically significant (P<0.001). Similar results were seen for the number of working days lost by care giver (P=0.017). Among the injured 139 people returned to their normal routine activities. Among the rest 9, one death occurred and the rest 8 were permanently disabled. The median values for injured person to return back to their normal routine

activities differed significantly between moderate and severely injured persons and this was found to be statistically significant (P<0.001). Among injured 74 caregiver's activity was disrupted. When we calculated the median values b/w moderate and severely injured persons for this we found that the number of days differed significantly among the two groups (P<0.001) (Table 3).

Out of 148 injured only 9 (6.08%) lost their existing jobs. Among the 9 people who lost their existing jobs only one person belonged to moderately injured and was unemployed for 300 days and the rest 8 belonged to severely injured group and the median (IQR) number of days lost was 30 (30-75) days. Since there was only one person in the moderately injured group no further statistical analysis was calculated.

Social impact of injuries was also assessed in terms of family break up, education loss, employment opportunity and impairment/activity limitation/participation restriction. It was found that irrespective of severity of injuries there was no family break up (i.e cancellation of marriage or divorce or any family member getting separated from the family following an injury). With respect to employment opportunity, i.e joining a new job following an injury; for majority of them injury did not affect. Educational loss (included important tests or examinations missed or failed in any subjects or not able to pursue higher studies) following an injury was minimal but was statistically significant (P=0.035) between the two groups. Social impact was also assessed through development of impairment or activity limitation or participation restriction present even after 30 days of injury as experienced by the injured. Chi square test was found to be significant (P<0.01) (Table 4). In our study 43 (29.1%) experienced impairment/ activity limitation/ participation restriction. Among them majority i.e. 18 (41.9%) were walking with a limp and 14 (32.6%) experienced difficulty to use hand or arm.

Economic impact of injuries

The mean and median amount of direct expenditure incurred by the injured and their family was Rs. 14826 (Rs53664) and Rs. 1500 (500-4912.5). That of indirect expenditure incurred was Rs. 16737 (Rs. 36348) and median value of Rs. 550 (750-10500) (Table 5). A single injury on an average resulted in total expenditure of Rs. 31563 including the direct and indirect expenditure.

In our study majority of the families met their expenditure from their savings alone 109 (73.6%), while 26 (17.6%) took loan. Out of 109 injured who met their expenditures from their savings, 43 (39.5%) was severely injured. Average amount of loan borrowed was Rs. 19124 (SD=41188). Only 2(1.4%) people were covered by health insurance and 6 (4.1%) of them sold some kind of property (like gold jewels, lands or houses) to meet the expenses. Average amount of property sold worth was Rs. 18000 (SD=18384).

Table 4: Distribution of injured persons by severity of injury and its social impact.

Injury leading to family break up n (%)			Total	Test of significance, degrees of freedom (df) & P value
Severity of injury	Yes	No		Fisher exact test df = 1 P =0.1
Moderate	0(0)	79 (100)	79 (100)	
Severe	3 (4.3)	66 (95.7)	69 (100)	
Total	3 (2)	145 (98)	148 (100)	
Injury leading to loss of employment opportunity n (%)				Fisher exact test df = 1 P= 0.47
Moderate	3 (3.8)	76 (96.2)	79 (100)	
Severe	5 (7.2)	64 (92.8)	69 (100)	
Total	8 (5.4)	140 (94.6)	148 (100)	
Injury leading to education loss n (%)				$\chi 2$ =4.433 df = 1 P = 0.035
Moderate	5 (6.3)	74 (93.7)	79 (100)	
Severe	12 (17.4)	57 (82.6)	69 (100)	
Total	17 (11.5)	131 (88.5)	148 (148)	
Injury leading to impairment/activity limitation/ participation restriction after 30 days of injury n (%)				$\chi 2$ =24.297 df = 1 P <0.001 (*A case of death has been included under yes column)
Moderate	10 (12.7)	69 (87.3)	79 (100)	
Severe	34 (49.3)	35 (50.7)	69 (100)	
Total	44* (29.7)	104 (70.3)	148 (100)	

Table 5: Expenditure incurred by the injured people and their families.

Direct expenditure incurred due to (n)	Mean expenditure (Rs.) (SD)	Median expenditure (Rs.) (IQR)	Minimum to Maximum expenditure (Rs.)	Total expenditure (Rs.)
Hospital (148)	1010.8 (36437)	1000 (302-2637.5)	30-250000	1500000
Travel (127)	1542.6 (4096)	250 (100-1000)	20-30000	196000
Legal (2)	500 (0)	500	500	1000
Funeral (1)	2000 (0)	2000	2000	2000
Miscellaneous (100)	4994.1 (2404)	400 (162.5-1500)	30-230000	499000
Total direct (N=148)	14826 (53664)	1500 (500-4912.5)	50-500000	2190000
Indirect expenditure incurred due to wages lost by (n)				
Injured (39)	18311 (37410)	6000 (2000-10500)	320-200000	714000
Caregiver (18)	5888 (9702)	1150 (500-9250)	100-30000	106000
Total indirect (n=49)	16737 (36348)	550 (750-10500)	100-215000	820000

DISCUSSION

In our cross sectional study information was collected regarding the amount spent, the number of working days lost and the number of days the injured person was disabled. Certain amount of information bias could be possible in our study. However effort was made to minimize such information bias by cross checking the medical records such as X-rays, discharge summaries and medical bills. Also a local event calendar was applied in the field to minimize the recall bias.

Few people were hesitant to give information in sensitive issues of assault, violence or suicides there by resulting in an underestimation of these events. So certain amount of response bias could have occurred in our study. In the present study mild injuries have been excluded from the study assuming that not much of socio-economic impact will be experienced by those individuals. So proportionately moderate and severe injuries appear to be in large numbers

In the study conducted in rural South Western Nigeria the prevalence of injuries was 3.34% in the past 4 months[7] while in our study it was 4.93%. The difference may be attributed due to the difference in recall period. While a study conducted by Tercero at Nicaragua showed prevalence of moderate or severe injuries using Abbreviated Injury Score was 7%[8] and that conducted in Khartoum State, Sudan showed prevalence of 8.3%.[9] In a study conducted at Andhra Pradesh, India showed prevalence of non-fatal injury 6.7%.[10] The mean age among the injured people was 30±15 years.[7] Higher proportion of injuries were sustained by males compared to the females ($p = 0.043$)[7] and common in the age group of 16-44 years.[7,8] High proportion of injuries among males was also seen in our study probably due to higher chance of exposure to injuries for males either on the roads or in the work place (occupational injury). Falls and traffic injures were common[7,9,10] which was also observed in our study. Lower limb was the most common site of injuries.[7,9] Road traffic injuries and falls were the most common cause of injury in these studies and lower limbs is the common site involved in such kind of injuries. Majority of the injuries occurred at home and street[7,8] which was also seen in our study. Unintentional injuries accounted 81%[7] and 96.5%.[10] Of the 11 intentional injuries, assault was most common 55%.[7] Even in our study unintentional injuries and among the intentional injuries assault was the most common. So majority of the injuries are unintentional type and occur inadvertently.

Prevalence of disability among the non-fatal injuries was 10.9%[9] and majority had limping and difficulty in using hand which was also seen in our study. As a consequence to injury 9.3% lost their jobs indicating the social and economic impact of injuries.[9]

In our study there was no significant family break up following an injury probably because in India people tend to stay together and are more supportive at times of needy. Also injury dint affect the employment opportunity indicating that the work place supported the injured person at the time of crisis by allowing them to continue to work in their institutions. But severe injury led to educational loss, may be because following a severe injury, students were not in a position to prepare well or write the exams. This also explains the social impact on the individual following an injury.

In our study the mean indirect expenditure incurred (Rs. 16737) was higher than the mean direct expenditure (Rs. 14826) indicating that economic impact due to wages lost was high compared to the expenditures met to treat an injured patient. Similar effect of productivity loss was also seen in another study.[11] The total expenditure for one single injury was Rs. 31563. While the average monthly income of the injured families was Rs. 30245 (SD 36618) and median value was Rs. 20000 (IQR =Rs 10500-35000). So a single injury in a family would approximately utilize one month income of the family. The income meant to meet the basic needs of the family

members was being spent to treat the injured. So a single injury in a family can impose a huge economic burden on that family and even pull down that family to below the poverty line indicating the economic impact of injury on a family. Hence there is a need to cover many people under health insurance to reduce the out of pocket expenditure.

CONCLUSION

Among the 3003 population studied; 144 people met with moderate to severe kind of injuries in the past one year of recall period. Prevalence of injuries was 4.93% (4.1-5.7). Injuries were observed in both the genders and in all the age groups. The proportion was higher in the economically productive age group and among males. Among these falls and road traffic injuries were the common causes of injuries. The socio-economic impact of injuries; both on the injured and their families was significantly high. Injuries are one of the major public health problems currently witnessed in our country. Hence there is a need to address this issue and develop appropriate preventive strategies. In our study a single injury of severe nature had resulted in huge economic burden both on the injured and on the family. So we would like to recommend covering more people under social security measures (Ex: health insurance).

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