

ORIGINAL ARTICLE

Injuries in rural and urban areas of Agra district: an observational studySharma M¹, Srivastava A², Singh B³, Gupta SC⁴¹Assistant Professor, ^{2&3} Professor, Department Of Community Medicine, TMMC & RC Moradabad, ⁴Professor, Community Medicine, Saraswati Institute Of Medical Sciences, Hapur, Ghaziabad

Abstract	Introduction	Methods	Result	Conclusion	References	Citation	Tables
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Article Cycle

Address for Correspondence: Dr Mukesh Sharma, Assistant Professor, Department Of Community Medicine, TMMC & RC Moradabad
E Mail ID: sharma.mukesh40@gmail.com

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Abstract

Background: Injuries are becoming major public health problem worldwide and since India is also passing through a major socio-demographic, epidemiological and technological transition; injuries are coming up as an emerging health problem. **Objectives:** To find out prevalence of "Injuries", causative mechanism, place of injury & distribution in rural & urban area of Agra district. **Material & Methods:** It is type of observational study in rural & urban area of Agra district. The area to be surveyed was selected by multistage stratified random sampling technique. A recall period of three months for minor injuries & one year for major injuries or deaths due to injury was used. A total of 4 villages covering 2439 population and in urban area 2 mohallas & 2 slums covering 2410 population were surveyed. Data collected was entered on Fox. Pro (vs 2.6) and analyzed by SPSS (vs. 10). **Results:** A total of 93 persons in rural and 142 persons in urban had major while 147 peoples in rural and 200 peoples in urban had minor injuries during the recall period. Among the injured most common mechanism for major & minor injury was due to fall (45.16% & 36.73%). Regarding place maximum major injury occur at home (32.26%) in rural while in urban it was road/highway (46.48%) but for minor it the home being commonest place in both rural & urban (40.82% & 55%). **Conclusions:** Considering the high morbidities due to injuries focusing health education efforts based on local epidemiology and behavioral practices is needed.

Key Words

Traffic related injury; Fall related injury; Injury

Introduction

An injury is damage to a body organ which occurs rapidly and is visible, with the causative mechanism being sudden energy transfer.(1) Four factors that differentiate injury from other health conditions are: (i) a definite interaction between agent-host and environment, (ii) acuteness of the event, (iii) varying severity, and (iv) Chance of repetitiveness.(2)

Globally nearly 50 lakh people lost their lives due to injury as per WHO estimates during the year 2002 (WHO 2004a), injuries caused 9% of the total deaths.(3) The global injury mortality rate is estimated to be 98/100,000 population, with male and female rates of 128/100,000 (38 lakh deaths) and 67/100,000 (19 lakh deaths), respectively.(4) In India the precise number of deaths and injuries due to specific causes, or any scientific estimates of injury deaths in India are not available from any single source. Only

the national crime records bureau (NCRB) is the principal nodal agency under the ministry of Home Affairs, Government of India, and is responsible for the collection, compilation, analysis and dissemination of injury related information.(5)

Every year, injuries contribute to a significant number of deaths, hospitalizations for (short & long periods), emergency care, disabilities (physical, social and psychological), amputations, disfigurement, pain, suffering and agony. Many children become orphans, women become destitute and the elderly grieve in isolation. In addition, injuries also result in disruption of several activities leading to loss of work, income, education and other social activities, causing long term suffering among survivors and families.(1)

Aims

1. Distribution of injuries in rural & urban areas of Agra district. 2. Important mechanism resulting in injuries. 3. Physical nature of injuries, and 4. Disabilities caused by the injuries.

Methods

Present study was conducted in Agra district (U.P). Population of district was 3.62 million with rural being 2.05 million & urban 1.57 million. For administrative purpose, district is divided into 6 tehsils and 15 rural blocks. Agra Corporation is divided in 80 municipal wards. Present study was undertaken in rural & urban mohallas and slums of the district.

It was a cross-sectional type of study. The study population was persons having either major or minor injury in household of surveyed population. A multistage stratified random sampling technique was adopted for selecting desired population. A recall period of three months for minor injuries & one year for major injuries or deaths due to injury was used. Study

period was May 2005–Oct 2006. For calculating a suitable sample size that could generate relevant information on the concerned issues, indicators selected was overall prevalence of injuries. It was revealed from the data published by WHO (2004) from community based survey for nearest country where it was 41.2 per 1000 population, since it was a community based study so it was used for calculation of sample size. Sample size was calculated by using the formula $N=4pq/(20\% \text{ of } p)$, Where, p = prevalence of injuries (positive character), $q=100-p$, 20% of p is taken to allow for margin of error, N = minimum sample size. Thus the minimum sample size comes out to be 2357. To minimize the sampling error and keeping the dropouts and non-respondents in consideration, the sample size is increased and rounded off to 2400. For selecting the desired population firstly from list of wards two wards from & one block from rural were selected randomly from list available with Municipal corporation of Agra, now from the each selected ward one mohalla and one slum were further selected randomly in urban area and from one block two PHC's were selected further from that two villages from each selected PHC, one near the PHC and other from remote area in rural setup were selected. From each selected unit whole of the village / slum / mohalla was spanned using left hand rule until target population was covered or area completed. A total of four villages from two selected PHCs covering 2439 population, and in urban area a total of one mohalla and one slum from two selected wards covering 2410 population were surveyed. Data thus collected on semi-structured, predesigned, pretested and open ended questionnaires was computerized on regular basis in specific program developed on Fox-Pro (version 2.6) and then analyzed with the help of SPSS Software (version 10) and results transferred

to predesigned, classified tables prepared according to aims & objectives.

Result

It was found that a total of 93 persons in rural area and 142 persons in urban area had major injury during last one year preceding the day of survey while 147 persons in rural and 200 persons in urban had minor injuries during the recall period of 3 months.

Among injured persons, it was found that majority of major injuries were 'due to fall' (45.16 % in rural & 33.80% in urban area). Second commonest mechanism was 'Traffic' (19.35% & 28.17%) and a struck or hit by some person or to an object was third common mechanism (16.13% & 11.27%) in rural and urban area respectively. Other less common mechanism were stab or injury by sharp object (9.68% in rural & 5.63% in urban area) and by electricity (3.23% in rural). Nearly 6.45% injuries in rural and 9.86% injuries in urban area were due to other mechanism. There was no major injury from fire weapons/ pistols and fire/flames/heat among rural and electricity among urban area. The overall difference in the mechanism of major injuries in rural-urban areas was found to be insignificant however injuries by fire weapons/ pistols and fire/flames/heat were found only in urban area so being significantly different in urban area. Regarding mechanism of minor injuries it was found that the commonest mechanism was again 'due to fall' (36.73% in rural & 39% in urban area) while second mechanism was stab/sharp object (22.45%) in rural and a struck or hit by some persons or object (22.0%) in urban area. Traffic was third common mechanism for minor injuries (16.33% in rural & 13% in urban). Other less common mechanism were struck or hit by person or object (8.16%) and fire/flames/heat (4.08%) in rural and stab/sharp object (11.0%), electricity (8.0%) and fire/flames/heat (6.0%) in urban

area. There was no minor injury from fire weapons/pistols in both rural and urban area. There was significant difference in different mechanism of injuries among rural and urban area however the variation in occurrence of injuries among rural and urban area by individual mechanism was found to be insignificant for traffic, due to fall, fire/flames/heat while there were significantly more injuries due to struck/hit by person or object and electricity and significantly less due to stab/sharp object and other mechanism group in urban area. ([Table 1](#))

Regarding major injuries, in rural area maximum injury occurred at home (32.26%) followed by road/ highway and industrial area (29.03% & 12.90%) while in urban area, maximum injuries occurred at road/highway (46.48%) followed by residential area (19.72%), home and occupational area (18.31% & 11.27%). This difference in frequency of major injuries in association with their place of occurrence was found to be significant however rural urban variation was insignificant for playground. Home as a place of injury was more common in rural area while others were more common in urban area. Regarding minor injuries; maximum injuries were again at home (40.82% & 55%) in both rural and urban area followed by residential area (22.45%) in rural and road/highway (12%) in urban area. Other places with fewer injuries in rural area were road/highway, at farms and industrial area (18.37%, 10.2% & 4.08% respectively) while in urban area these were occupational area, residential area, school and playground (11%, 10%, 5% & 3%). This difference in place of occurrence of minor injuries among rural and urban area was highly significant however this difference was insignificant for road/highway and industrial area. Road/highway, residential area, industrial area and farm as a place of injury were more common in rural area while home

and occupational area were more common in urban area. ([Table 2](#))

Regarding major injury, in rural area maximum were at paid work group (35.48%) followed by unpaid work group (25.81%). This was reversed in urban area as unpaid work (50.70%) was more followed by paid work (23.94%). Other common occupation during injury was 'sport' (16.13 in rural & 22.54% in urban). This difference in injury occurrence in various occupation at the time of injury among two area was highly significant also there was significant difference in injuries in rural & urban area among unpaid worker, education & daily vital activity as daily vital activity group & education group had no injury and unpaid worker being commonly injured in urban area. Regarding minor injuries, majority of injuries in rural area occurred during sport (38.78%) followed by paid work (22.45%), unpaid work (20.41%) and daily vital activities (14.29%) while in urban area, majority occurred during daily vital activities (30.0%) followed by unpaid work (25%), paid work (17%), sports (16%) and leisure time work (10%). This difference in injury occurrence in relation to work during injury was highly significant among rural and urban area. Regarding rural urban variation injuries were more during leisure time work and daily vital activities in urban area while during sports in rural area. ([Table 3](#))

Discussion

On review of available literature it was found that most of the studies conducted on injuries are either hospital or facility based so do not give a clear picture of real burden. There is a paucity of community based research work on this topic and few studies that were done covered partial aspects like either one area i.e. rural or urban or a single mechanism like traffic etc. moreover in developing country like India only few studies were done on this neglected topic of public health importance. Only one

study on injuries covering all such aspects was conducted in Bangalore according to WHO guidelines (7) but only some results were found in the articles published by the author.

Estimating the burden of injuries is crucial for understanding the magnitude of the problem, developing mechanisms for intervention, allocating physical, human, financial resource for control of the problem, and for reducing the burden of injuries in the coming years. In this study the ratio of serious injuries resulting in some type of impairment to minor injuries was 1:5.95 and a review of other Indian studies and observations by other agencies indicate the ratio of serious injuries needing hospitalization to minor injuries as 1:2.5. In Bangalore and Haryana this ratio was 1:2.7 & 1:2.4, respectively.(9,10) A large-scale population-based survey of 96,569 individuals from Bangalore revealed a ratio of 1:2 for hospitalizations: injuries.(11)

The annual incidence of major injuries was 38.13 in rural and 58.92 in urban areas, and quarterly incidence of minor injuries was 60.27 in rural and 82.99 in urban area per thousand population this was much more than found in population based survey from Bangalore in which incidence rate was 12 in total, 10 each in urban and slum areas and 14 in rural area.(11) In another study in Delhi in urban area total incidence was 116 and injuries without disability 62 and with disability 9 per thousand individuals (12) and Verma et al in their study found injury incidence to be 93 per thousand in rural area of Faridabad, Haryana.(13) An injury incidence of 115 was seen in rural area of Punjab (14), in urban area of Bangalore (15) found injury incidence to be 51 and in a follow up study in rural area of Haryana (16) found the incidence to be 80. In a recent study sponsored by WHO in urban Delhi annual incidence of major injuries was found to be 73.1 per thousand population which included 1911 injuries without disability, 275 with temporary

disability of more than one month duration or permanent disability, corresponding to an annual incidence of 62.5 & 9 per thousand respectively.(12)

Majority of major injuries (45.16% in rural & 33.80% in urban area) and minor injuries (36.73% in rural & 39.0% in urban area) were 'due to fall'. Second commonest mechanism was 'traffic' (19.35% & 28.17%) and struck or hit by some person or object was third common mechanism (16.13% & 11.27%) in rural and urban area respectively for major injuries. In case of minor injuries it was found that second common mechanism was stab/sharp object (22.45%) in rural and a struck or hit by some person or object (22.0%) in urban area. Traffic was third common mechanism for minor injuries (16.33% in rural & 13.0% in urban area). There was significant difference in different mechanism of injuries among rural and urban area however the variation in occurrence of injuries among rural and urban area by individual mechanism was found to be insignificant for traffic, due to fall, fire/flames/heat while as an obvious fact there were significantly more injuries due to struck/hit by person or object and electricity and significantly less due to stab/sharp object and other mechanism group in urban area. This may be explained as due to difference in nature of individuals in rural and urban areas as in urban area there were more struck or hit injuries due to violence for land while in rural area sharp injuries were more due to sharp agriculture related equipment's. In a study at Delhi regarding mechanism of major injury fall was the commonest mechanism (38%) followed by Traffic (31%) and third common was mechanical injuries (11%). 12 Burn (8%) & Animal bite (7%) were the next two mechanisms of major injuries. In another study by M Cardona et al, the five leading causes of non-fatal injury among adults were falls (38.8%), road traffic crashes (25.5%),

mechanical forces (16.4%), animal bites (8.5%).(17)

Road/highway, residential area, industrial area and farm as a place on injury were more common in rural area while home and occupational area were more common in urban area. This may be explained as thought that only outside exposure results in injuries but it was found that environment has lesser effect then personnel attitude as injuries were occurring at home in large. In the study by Pramod Verma in MCD Delhi majority of major injuries occurred at home (41.26%), followed by road (39.8%).(12) In another study by M Cardona et al place of injury was the home for 38.6%, the road for 30.5%, the workplace for 27.4%, and "other places" for 3.5%.17

Most of the major injuries in rural area occurred in paid work group (35.48%) followed by unpaid group (25.81%). This was reversed in urban area as unpaid work group (50.70%) was more followed by paid work (23.94%). Other common activity during injury was 'sport' (16.13% in rural and 27.54% in urban). In case of minor injuries, majority in rural area occurred during sport (38.78%) followed by paid work (22.45%), unpaid work (20.41%) and daily vital activities (14.29%) while in urban area, majority occurred during daily vital activities (30.0%) followed by unpaid work (25.0%), paid work (17.0%), sport (16%) and leisure time work (10.0%). This was obvious because in rural area paid work mainly include agriculture related occupation which is less organized sector while in urban area most of the injuries were due to neglect and hence among unpaid group and this was also true in case of minor injuries. In another study by M Cardona et al the occupational group most often affected by injury was unskilled manual workers (54.1%) followed by housewives (25.5%).(17) Those who reported road traffic injuries were mainly male (85.2%); the male to female relative risk was 4.2 for nonfatal road

traffic injuries and 0.28 for household injuries. In the study by Pramod Verma in MCD Delhi most of the injuries occurred during daily routine work (69%), followed by recreative activities (20.5%), due to hurry (3.9%) & fatigue after work (2.4%).(12)

Conclusion

Based on the study findings, injury causes a large number of morbidity in Agra district both in rural & urban area. Injury should be treated as a public health problem. Falls were the most common types followed by road traffic accidents, stab or hit by an object & animal bites. Regarding place, majority of injuries were occupational related either in the residential area or road/highways and also most of the injuries were work related either paid or unpaid.

There is no uniform regular recording and information keeping system, neither within the government institutions, nor with the private ones. Therefore policy has to be devised by the policy makers so that this limited and unsystematic information can be tackled. Also injury has not been an inter-sectoral issue so agencies need a strong coordination and directive so that this serious public health problem can be dealt.

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Tables

TABLE 1: DISTRIBUTION OF INJURIES ACCORDING TO THEIR MECHANISM IN RURAL AND URBAN AREA

Mechanism of Injury	Type of Injury				(Rural vs Urban) z =	
	Major		Minor		Major	Minor
	Rural No. (%)	Urban No. (%)	Rural No. (%)	Urban No. (%)		
Traffic	18 (19.35)	40 (28.17)	24 (16.33)	26 (13.0)	1.58	0.86
Fall	42 (45.16)	48 (33.80)	54 (36.73)	78 (39.0)	1.75	0.43
Struck/hit by person or object	15 (16.13)	16 (11.27)	12 (8.16)	44 (22.0)	1.05	3.74
Stab/sharp object	9 (9.68)	8 (5.63)	33 (22.45)	22 (11.0)	1.12	2.80
Fire weapon/pistol	-	6 (4.23)	-	-	2.50	-
Fire/Flames/Heat	-	4 (2.82)	6 (4.08)	12 (6.0)	2.01	0.82
Electricity	3 (3.23)	-	-	16 (8.0)	1.76	4.16
Others	6 (6.45)	14 (9.86)	18 (12.24)	12 (6.0)	0.96	1.97
Total	93	142	147	200	*p<0.05	
Test of Significance	$\chi^2 = 7.86, df = 4, p > 0.05$		$\chi^2 = 20.5, df = 4, p < 0.001$			

TABLE 2: DISTRIBUTION OF INJURIES ACCORDING TO THEIR PLACE OF OCCURRENCE IN RURAL AND URBAN AREA

Place of Injury	Type of Injury				(Rural vs Urban) z =	
	Major		Minor		Major	Minor
	Rural No. (%)	Urban No. (%)	Rural No. (%)	Urban No. (%)		
Home	30 (32.26)	26 (18.31)	60 (40.82)	110 (55.0)	2.39*	2.64*
School	0	0	0	10 (5.0)	-	3.23*
Road/Highway	27 (29.03)	66 (46.48)	27 (18.37)	24 (12.0)	2.77*	1.62
Residential Area	9 (9.68)	28 (19.72)	33 (22.45)	20 (10.0)	2.22*	3.08*
Playground	3 (3.23)	6 (4.23)	0	6 (3.0)	0.40	2.47*
Industrial Area	12 (12.90)	0	6 (4.08)	4 (2.0)	3.70*	1.09
At farm	6 (6.45)	0	15 (10.20)	0	2.53*	4.08*
Occupational Area	0	16 (11.27)	3 (2.04)	22 (11.0)	4.24*	3.58*
Rural Area	6 (6.45)	0	3 (2.04)	0	2.53*	1.74
Others	0	0	0	4 (2.0)	-	2.00*
Total	93	142	147	200	*p<0.05	
Test of Significance	$\chi^2 = 17.66, df = 4, p < 0.05$		$\chi^2 = 19.07, df = 4, p < 0.001$			

TABLE 3: DISTRIBUTION OF INJURIES IN RURAL AND URBAN AREA ACCORDING TO WORK BEING DONE AT THE TIME OF INJURY

Work during Injury	Type of Injury				(Rural vs Urban) z =	
	Major		Minor		Major	Minor
	Rural No. (%)	Urban No. (%)	Rural No. (%)	Urban No. (%)		

Paid work	33 (35.48)	34 (23.94)	33 (22.45)	34 (17.0)	1.89	1.25
Unpaid work	24 (25.81)	72 (50.70)	30 (20.41)	50 (25.0)	4.03*	1.02
Education	6 (6.45)	0	0	0	2.53*	-
Sport	15 (16.13)	32 (22.54)	57 (38.78)	32 (16.0)	1.24	4.76*
Leisure time work	0	0	0	20 (10.0)	-	4.70*
Daily vital activity	12 (12.90)	0	21 (14.29)	60 (30.0)	3.71*	3.62*
Not doing any work	3 (3.23)	0	3 (2.04)	4 (2.0)	1.75	0.02
Others	0	0	3 (2.04)	0	-	1.74
Total	93	142	147	200	*p<0.05	
Test of Significance	$\chi^2 = 30.86, df = 4, p < 0.05$		$\chi^2 = 39.73, df = 4, p < 0.001$			