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### Road traffic accidents and their relationship with severity of head injury according to type of road user: An epidemiological survey in a tertiary care hospital in Kollam, Kerala

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#### ABSTRACT

**BACKGROUND:** Road traffic accidents are now becoming a leading cause of death among younger population. Every year nearly 1 million people die due to these accidents. Pedestrians are most vulnerable for injury in accidents. Head injury is an important cause for these deaths.

**OBJECTIVE:** To find out the distribution and severity of road traffic accidents and to find the association between type of road user and head injury received during accident.

**MATERIAL AND METHODS:** A cross sectional study conducted in a tertiary care hospital of Kollam, Kerala. 400 patients admitted during October 2014 to march 2015 in the casualty for road accidents were selected for analysis. Emergency case files of these patients were studied in detail. Epi Info version 3.5.1. was used for analysis. Chi-square test was done to find significance. Difference was accepted as significant at more than 95% ( $p$ -value  $<0.05$ ).

**RESULTS:** The mean age of patients was 39 years. Maximum (25%) patients were of the age group 21-30 years. 75% were males and 48.2% suffered head injuries. 24.75% were pedestrians. Out of these 57.6% suffered head injury. 5.8% of patients suffered severe head injury. Pedestrians suffered more (10.1%) severe head injury than non-pedestrians (4.3%). 6.5% succumbed to their injuries. Death rate among patients who suffered head injury (10.4%) was significantly more as compared to those who did not have head injury (2.9%).

**CONCLUSION:** Road traffic accidents are a major public health problem although it can be prevented. Pedestrians should be very careful. The patients who receive head injury are at greater risk for mortality.

**Key words:** Road traffic accidents, Kollam, Pedestrians, Head injury

#### INTRODUCTION

Road traffic accidents (RTAs) are predicted to become fifth leading cause of death by 2030 from ninth in 2004 worldwide. These are one of the main causes of death among younger population aged

15-29 years<sup>1</sup>. Every year 1.2 million people are killed in RTA. Low and middle income countries are worst hit accounting for about 85% of these deaths<sup>2</sup>. During 2012, 0.4 million RTAs occurred in India. In Kerala, 36,174 cases of RTA occurred in

which 4286 people died. Although death rate due to RTA in Kerala is less (11.8%) as compared to national average (31.6%)<sup>3</sup>. Head injury has been defined as a physical damage to the scalp, skull or brain produced by an external force<sup>4</sup>. In United States, Road accidents are second leading cause of head injury (17.3%) and result in the largest percentages (31.8%) of head injury related deaths<sup>5</sup>. In India, pedestrians contribute to nearly 30-40% percent of all RTA. Pedestrian injuries form a major percentage of workload in emergency department<sup>6</sup>. There are not many studies done to see RTAs and its effect on pedestrian head trauma. Keeping this fact in mind, we did a study to find out the distribution and severity of RTAs and to find the association between type of road user and head injury received during accident.

## MATERIAL AND METHODS

A hospital based cross sectional study was conducted in casualty of Travancore Medical College hospital, Medicity, Kollam. During October 2014 to march 2015, the casualty in the hospital attended nearly 455 RTAs. Emergency case files of these patients were studied in detail. A proforma was made and information like age, sex, type of patient, head injury received and Glasgow's Coma Scale (GCS) was noted. Study unit was individual patients and study subjects were all the RTA patients irrespective of age group admitted to our casualty in that period. It was retrospective study although we collected the missing data by having a telephonic conversation with the victim himself or their relatives. Severity of injury was classified according to GCS: Mild (13-15),

Moderate (9-12) and severe (3-8). We analyzed all the files but the analysis was complete only for 400 patients. In case of others, the data was incomplete and they did not respond to our calls either. Epi Info version 3.5.1. was used for analysis. Chi-square test was done to find significance. Difference was accepted as significant at more than 95% ( $p$ -value <0.05).

## OPERATIONAL DEFINITIONS

### RTA

A road vehicle collides with another vehicle or pedestrian and result in injuring or killing at least one person.<sup>7</sup>

### TYPE OF ROAD USER

What was the status of the injured patient at the time of RTA? e.g. pedestrian, Non-pedestrian (motorized two wheeler or four wheeler).

## RESULTS

In the present study, we selected 400 RTA patients admitted in our casualty in last 6 months for analysis. The mean age of patients was 39 years (Standard Deviation of 17 years) with mean for males being 38 years and for females being 44 years. The age of youngest patient was 6 months and oldest was 83 years. Figure 1 shows age distribution of patients. Maximum (25%) patients were of the age group 21-30 years while minimum (2%) were in the age group 0-10 years. Almost 57% of the patients were of the age group 21-50 years. Geriatric patients were nearly 12%. Figure 2 shows sex distribution of patients. 75% were males while 25% were females.

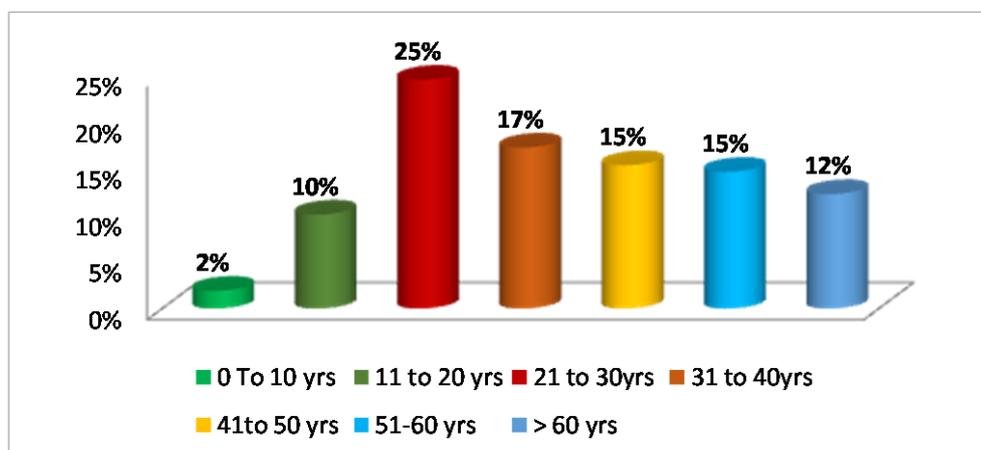
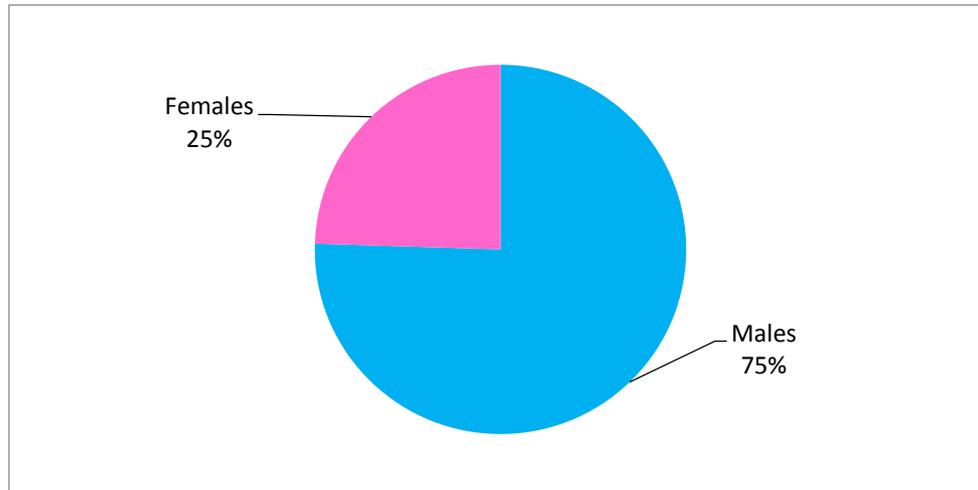


Figure 1: Age group distribution among RTA patients



**Figure 2: Sex distribution among RTA patients**

Table 1 shows that out of 400 RTA patients, 193 suffered head injuries. So, the prevalence of head injury was 48.2% (as all of the victims were susceptible or at risk for head injury). 99 patients were pedestrians giving percentage of pedestrians among RTA patients to be 24.75%. Out of these 57.6% suffered head injury. Among those who

were not pedestrians i.e. travelling in two wheelers or four wheelers or in bus, 45.2% suffered head injury. All these differences are significant ( $p < 0.05$ ). So, pedestrians suffered more head injuries as compared to non-pedestrians and the risk was nearly one and half times more (OR=1.64, 95% C.I. 1.04-2.60) among pedestrians.

**Table 1: Association between Head injury and type of road user**

Type	Head Injury			Statistics	
	Yes	No	Total	OR	95% of CI
Pedestrian	57 (57.6)	42 (42.4)	99	1.64	1.04-2.60
Yes	57 (57.6)	42 (42.4)	99	1.64	1.04-2.60
No	136 (45.2)	165 (54.8)	301	-	-
Total	193 (48.2)	207 (51.8)	400	-	-

Figures in parenthesis are in percentages

$\chi^2 = 4.58$ , DF = 1,  $p = 0.032$ ; significant

Table 2 analyses the severity of head injury according to GCS and type of road user. We found that the percentage of patients who suffered from Mild (13-15), Moderate (9-12) and severe (3-8) head injuries were 82%, 12.2% and 5.8%. In pedestrians, 10.1% patients suffered severe head

injury while in non-pedestrians only 4.3% had severe head injury. More (86.4%) non-pedestrians had mild head injury as compared to pedestrians (68.7%). All these differences are highly significant ( $p < 0.0001$ ).

**Table 2: Severity of head injury according to GCS and type of road user**

Type	Severity of head injury				Statistics
	Mild	Moderate	Severe	Total	
Pedestrian	68 (68.7)	21 (21.2)	10 (10.1)	99	$\chi^2 = 15.80$ , DF = 2,
Yes	68 (68.7)	21 (21.2)	10 (10.1)	99	$p < 0.0001$ ;
No	260 (86.4)	28 (9.3)	13 (4.3)	301	Highly significant
Total	328 (82)	49 (12.2)	23 (5.8)	400	

Figures in parenthesis are in percentages

Table 3 finds association between head injury and mortality. Out of 400 patients, 26 (6.5%) died of injuries inflicted in accident and during stay in the hospital. This cannot be the real death percentage as some would have died after discharge from hospital. We found out that the death rate among patients who suffered head injury (10.4%) was

more as compared to those who did not have head injury (2.9%) and the difference was significant ( $p < 0.05$ ). The overall risk of mortality among patients who had head injuries was nearly four times more as compared to those who did not suffer head injuries.

**Table 3: Association between Mortality and head injury**

Head Injury	Mortality		Total	OR	95% of CI	Statistics
	Yes	No				
Yes	20(10.4)	173(89.6)	193	3.87	1.52-9.86	$\chi^2 = 9.15$ , DF = 1, $p = 0.002$ ; Significant
No	6(2.9)	201(97.1)	207	-	-	
Total	26(6.5)	374(93.5)	400	-	-	

Figures in parenthesis are in percentages

**DISCUSSION**

Among RTA patients of our study, most common age group affected was 21-30 years. WHO states that RTAs are the leading causes of morbidity and mortality among population of 15-29 years age group in both sexes in the world.<sup>1</sup> The same findings were seen in studies done in India.<sup>3, 8</sup> This is the age group which goes out mostly for studies or works and has a tendency to be a little impetuous. Geriatric patients were nearly 12% among RTA victims. Studies have shown the vulnerability of elderly population in RTAs. They are more prone to trauma as they have less balance, fall easily, and hit by vehicles.<sup>9, 10</sup> Three fourth of the RTA patients were males. A retrospective study done in Hapur (Uttar Pradesh) showed that 74% of the victims of RTA were males.<sup>11</sup> National Crime Records Bureau of India and various other studies also proves that males are most affected in RTAs.<sup>3, 12, 13</sup> Nearly half of the RTA patients suffered head injury. Other studies also prove this fact.<sup>14-16</sup> 25% of the RTA patients were pedestrians. Walking by road is a very common mode of transport in low and middle income countries and pedestrian accidents have been increasing in these countries.<sup>9</sup> Studies done in various parts of India have shown that 13-26% of the RTA victims are pedestrians.<sup>17-19</sup> Among pedestrians, 57.6% suffered head injury. Pedestrians suffered more severe head injuries as compared to non-pedestrians. Malhotra et al observed in their study that severity of injuries was greater in pedestrians.<sup>20</sup> 5.8% of the RTA patients suffered severe head injury with 3-8 score of GCS. Urfi et al found that 8% of the RTA victims had severe head injury with GCS of 3-8.<sup>21</sup> GCS is an

important predictor of outcome. If it is high (13-15), we can expect a good outcome and if it is low (3-8), adverse outcome is inevitable.<sup>22</sup> Patients who suffered head injury died more (10.4%) as compared to those who did not suffer head injuries (2.9%). Head injury as the most common cause for mortality among RTA cases was seen by Farooqui et al.<sup>23</sup> Mortality survey of over 122000 deaths at all ages from 2001 to 2003 in India showed that RTA causes a substantial number of deaths especially among pedestrians.<sup>24</sup> Gururaj elaborated some principles to be followed if we want to decrease RTA and its related morbidity in India. A clear policy on road safety, a coordinating cell, proper allocation of budget, strict interventions and a reliable information system is the need of the hour. Health professionals can contribute and should become a role model.<sup>25</sup>

**CONCLUSION**

RTAs are slowly becoming a major public health problem. The majority of patients in our study were young in their productive years and male preponderance was seen. Pedestrians are at risk while commuting. The severity of head injury is an important predictor for prognosis. The mortality is directly related to head injury.

**RECOMMENDATIONS**

We all must follow the traffic rules. There should be no haste while driving because by doing so we are putting others life in danger apart from ours. Pedestrians must take precautions. Immediate transfer of the victim to a nearby hospital is also necessary.

## LIMITATIONS

It has the common drawbacks of retrospective studies depending solely on case records but we tried to minimize it by telephone calling to the victims and filling missing data. Anyway there can always be recall bias and we relied on patients for the truth. The death rate is not final as some would have died after the discharge from the hospital.

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Nil

## CONFLICT OF INTEREST

None declared

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