

# Association Of Socio-Demographic Determinants with Economic Burden Among Road Traffic Accident Victims: A Longitudinal Study

Lalithambigai Chellamuthu<sup>1\*</sup>, Devi Kittu<sup>2</sup>, Yogesh Bahurupi<sup>3</sup>, Kavita Vasudevan<sup>4</sup>

<sup>1</sup>Mahatma Gandhi Medical College and Research Institute, Puducherry, India

<sup>2,4</sup>Indira Gandhi Medical College and Research Institute, Puducherry, India

<sup>3</sup>All India Institute of Medical Sciences Rishikesh, Uttarakhand, India

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## ABSTRACT

**Background:** RTA are the sixth leading cause of death in India with a greater share of hospitalization, disabilities, deaths and socio-economic losses. The study was conducted to assess the socio-demographic determinants associated with households' economic burden among RTA victims.

**Methods:** A longitudinal study was conducted for 2 years in Puducherry employing simple random sampling to include 169 accident victims. Baseline data was collected with a semi-structured questionnaire on socio-demographic details, direct and indirect costs towards road traffic injuries. Follow up was at 6<sup>th</sup> and 12<sup>th</sup> month from the day of accident. Data entry and analysis were performed using Epi-data. Written informed consent from each participant was sought. Ethical clearance received.

**Results:** Mean age of the accident victims was 36.2 (11.4) years. The median (IQR) for direct, indirect and total expenses were INR 1500 (1000-22100), 18000 (2400-46500) and 3000 (1037-47125) respectively. Association between the median (IQR) indirect expenses and marital status as well as socio-economic status of victims were found to be statistically significant.

**Conclusion:** Accident victims and their family faced financial burden, as a large proportion of victims were from productive age group belonging to lower- and middle-class income group.

**Key words:** Longitudinal study, Community-based study, Road traffic accidents, Economic burden, Socio-demographic determinants

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**\*Correspondence:** Dr. Lalithambigai Chellamuthu (Email: lalli.muthu@gmail.com)

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## INTRODUCTION

Road traffic accidents (RTAs) are a major public health concern globally especially in low-income and middle-income countries.<sup>1</sup> One-fifth of fatalities due to road traffic accidents occurred in South Asia and road traffic injuries ranks eleventh in leading cause of DALYs lost in the region in 2010.<sup>2</sup>

India with rapid urbanization coupled with surge in motorization has resulted in 8% increase of road traffic fatalities annually for the last ten years and show no signs of decreasing trend.<sup>3-5</sup> The National Crime Records Bureau (NCRB) has reported highest accidental deaths per lakh population in Union territory of Puducherry.<sup>6,7</sup> Road traffic injuries are the sixth leading cause of death in India with the social costs of accidents valued between 2 to 3 % of the annual gross domestic product (GDP).<sup>1,8</sup> With this rate, India would lose more than one lakh crore rupees yearly due to road accidents besides social costs.

Road traffic injuries also place a huge burden on the health sector such as hospital admission, acute care and rehabilitation. However, road traffic accidents are grossly underreported in India which has a serious implication on the true estimates for identification of the vulnerable group, prioritizing the public health issues and formulation of cost-effective interventions for promoting road safety.<sup>9,10</sup>

Most of the existing literature were all facility-based, cross-sectional studies and had documented mainly the epidemiological profile of road traffic accidents. A few studies on costing of road traffic injuries had been published based on secondary data from insurance agencies and claim tribunals or from hospital bed occupancy. Household level data reflecting the actual costs suffered by the victims and family members as a result of the road traffic crashes were also very limited. Thus, there exists a knowledge gap on the determinants associated with economic burden borne by the road traffic accident victims and their households.

Against this background, the current community-based, longitudinal study was conducted with an aim to assess the socio-demographic determinants associated with households' economic burden among road traffic accident victims.

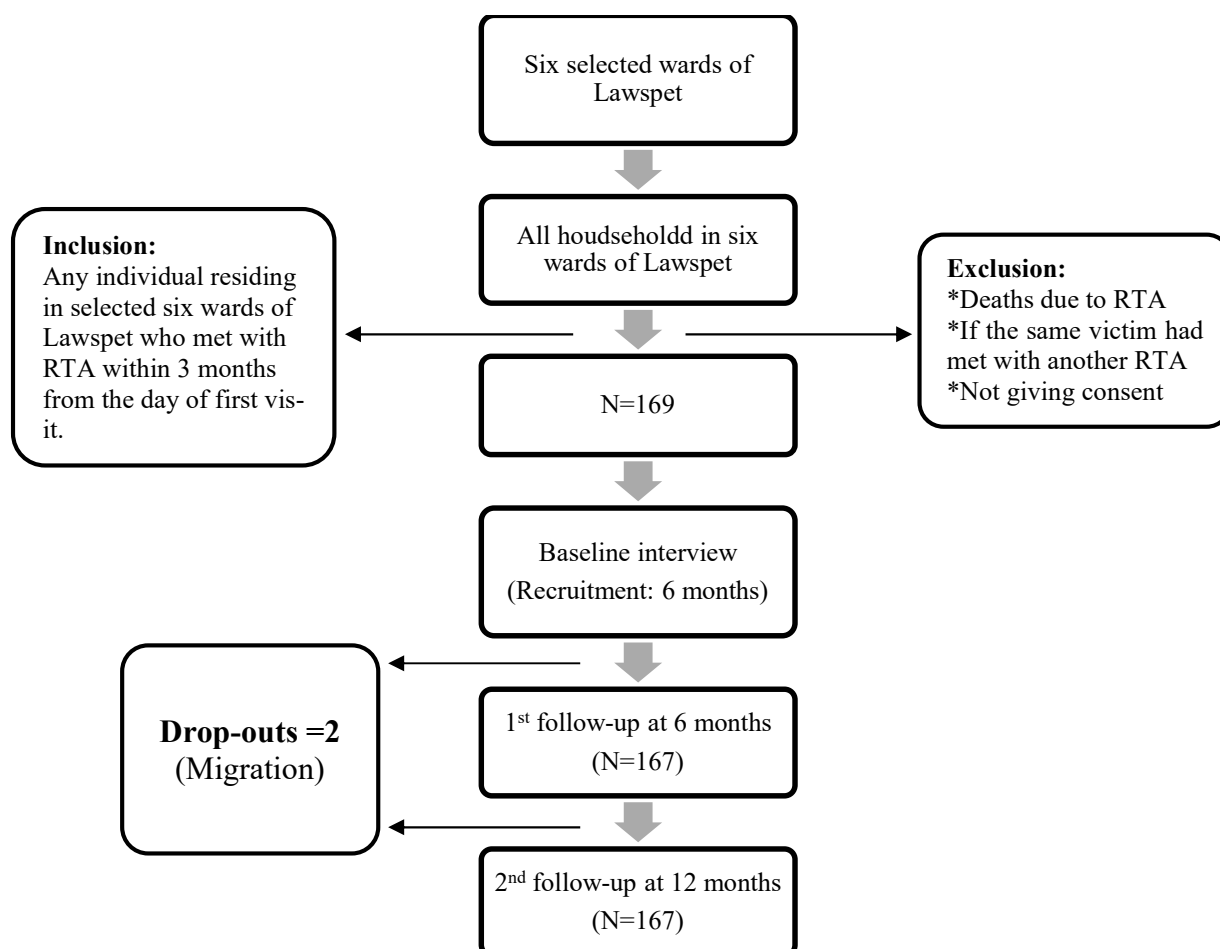
## METHODOLOGY

A community-based, longitudinal study among road traffic accident victims was conducted from March 2018 to 2020 (2 years) in Lawspet, one of the most densely populated urban constituencies in Puducherry district, South India.<sup>11</sup> In this study, the definition of an adult was considered as any individual who had completed 18 years of age.<sup>12</sup> Operational definition of road traffic accident was contemplated as "an accident which occurred or originated on a way or street open to public traffic; resulted in one

or more persons being injured, and at least one moving vehicle was involved."<sup>13</sup> The definition of serious injuries were fractures, severe general shock requiring medical treatment and any other serious lesions entailing detention in hospital for more than 24 hours.<sup>13</sup> Whereas, the simple injuries were all injuries not mounting to serious injuries or where hospitalization in less than 24 hours. As per World Health Organization (WHO), simple injuries and serious injuries have a recall period of three and twelve months respectively.<sup>14</sup> Therefore, the inclusion criteria for study participants were individual residing in Lawspet (during the period of recruitment – 6 months) who had met with a road traffic accident within three months from the day of household visit. Death due to road traffic crashes, repeat accident to the same individual in the past three months, adult victim not giving consent and for victim  $\leq 18$  years if the guardian or parent not giving consent for the study were all excluded. From existing 27 wards of Lawspet, six wards were selected by simple random sampling technique using lottery method with replacement and all the households in selected wards were included. A total of 169 road traffic accident victims satisfying the eligibility criteria were included in the baseline data collection.

The period of recruitment for the baseline data collection was six months with follow up visits on 6<sup>th</sup> and 12<sup>th</sup> month from the day of road accident (Fig 1).

All the households in the selected six wards of Lawspet were visited at least twice during the period of recruitment. Households that were found locked on first or second visit; an additional visit were made to those households within two weeks. Households that were found locked in all three visits were excluded. A pilot tested semi-structured questionnaire consisting of questions related to socio-demographic details of the household, direct, indirect and total cost of management towards road traffic accident. The cost of management of road traffic accident includes costs spent on medical or surgical management, transportation, legal affairs, property damage, informal care and loss of productivity.<sup>15</sup> Face to face interviews were conducted among adult victims whereas those victims who are  $\leq 18$  years data was collected from head of the family and/or mother of the victim. All the eligible study individuals were visited after 6 and 12 months from the day victim met with the road traffic accident. Same questionnaire was used for data collection excluding questions pertaining to socio-demographic details of the household. Households who migrated from the selected six wards to other places after baseline data collection, victims not willing to continue in the study were not followed up at 6 months and 12 months.



**Figure 1: Methodology and data collection process**

Adult victims were asked to give written informed consent. Written informed consent was obtained from guardian and parents if the accident victim was  $\leq 18$  years. Also, written informed assent was sought accident victims  $\leq 18$  years. from Ethical clearance for this study was received from the Institute Ethical Committee, Indira Gandhi Medical College and Research Institute, Puducherry (No. IEC/PP/2017/41). Data entry and analysis was performed using Epidata software. Descriptive data were represented as mean  $\pm$  SD or median (IQR) for numerical variables. Percentages and proportions for categorical variables were used. Appropriate tests of significance like Mann-Whitney U test or Kruskal-Wallis test was employed. Values of  $p < 0.05$  was considered to be statistically significant.

## RESULTS

The Table 1 depicts socio-demographic profile of road traffic accident victim and their head of the family respectively. Around 56 (33.1%) road traffic accident victims belonged to age group 34-43 years, 50 (29.5%) in 24-33 years, 23 (13.6%) in 44-53 years, 23 (13.6%) in 14-23 years and 15 (8.8%) in  $\geq 54$  years. This study observed that the mean (SD) age of the accident victims to be 36.2 (11.4) years and the

mean (SD) age of the accident victims' head of the family to be 40.6 (10.1) years. The mean (SD) of number of family members was found to be 3.7 (1.1).

**Table 1: Socio-demographic profile of road traffic accident victim (N =169)**

Socio-demographic variables	RTA victims (%)	RTA victims' Head of the Family (%)
<b>Gender</b>		
Male	146 (86.4)	161 (95.3)
Female	23 (13.6)	8 (4.7)
<b>Marital Status</b>		
Married	125 (74.0)	161 (95.3)
Single/Widowed/Separated	44 (26.0)	8 (4.7)
<b>Education</b>		
No formal education	4 (2.4)	8 (4.7)
School level (1-12 class)	117 (69.2)	122 (72.2)
Graduate & above	48 (28.4)	39 (23.1)
<b>Occupation</b>		
Unemployed/Housewife	20 (11.8)	0 (0)
Unskilled	34 (20.1)	45 (26.6)
Semi-skilled	20 (11.8)	21 (12.4)
Skilled	39 (23.1)	40 (23.7)
Clerical/shop/farm	9 (5.3)	10 (5.9)
Semi-professional	18 (10.7)	17 (10.1)
Professional	29 (17.2)	36 (21.3)

RTA - Road Traffic Accident

**Table 2: Median (IQR) expenses of victims towards road traffic accident**

Expenses towards road traffic accident	Median	IQR
<b>Direct expenses (n=50)</b>		
Medications	800	500-1000
Laboratory investigations	500	250 - 1750
Procedures	18000	1000 -24000
Total direct expenses	1500	1000 - 22100
<b>Indirect expenses (n = 31)</b>		
Victims' travel	18000	1000 - 24000
Victims' loss of wages	1000	600-7250
Caretakers' travel	1500	1000 - 1700
Caretakers' food expenses	1000	500 -1500
Caretakers' loss of wages	2000	1250 -3000
Total indirect expenses	18000	2400 - 46500
<b>Total (Direct + Indirect) expenses</b>	<b>3000</b>	<b>1037- 47125</b>

**Table 3: Association of socio-demographic determinants with median (IQR) indirect expenses**

Socio-demographic determinants	n=31	Median (IQR) Indirect expenses	p-value
<b>Age</b>			
≤45 years	28	27750 (2500-47250)	0.181*
>45 years	3	2100 (1900-2100)	
<b>Gender</b>			
Male	30	16750 (2325-42750)	0.093*
Female	1	99000	
<b>Education</b>			
School education	19	3150 (1900-39000)	0.074*
Graduate and above	12	41500 (4125-65875)	
<b>Occupation</b>			
Unemployed/Housewife	2	9800 (1600-9800)	0.296#
Unskilled/ Semi-skilled	12	9250 (1800-44375)	
Skilled/Semi professional	17	39000 (2825-59750)	
<b>Marital status</b>			
Married	25	36000 (2750-51250)	<b>0.017*</b>
Single	6	1600 (1050-23000)	
<b>SES</b>			
Middle	21	415000 (2825-60300)	<b>0.014*</b>
Lower	10	2750 (1475-22500)	
<b>Religion</b>			
Hindu	28	18750 (2175-45250)	0.815*
Muslims	3	4000 (2500-4000)	
<b>Type of family</b>			
Nuclear	29	18000 (2450-47000)	0.494*
Joint/Others	2	19800 (1600-19800)	

\*Mann-Whitney U test, #Kruskal-Wallis test

The road traffic accident victims were classified into different socio-economic class and occupational category based on modified Kuppuswamy classification (2019).<sup>16</sup> 62 (36.7%) belonged to upper-middle class, 55 (32.5%) were from upper-lower class and 52 (30.8%) were in lower-middle class. The median (IQR) income of the accident victims was INR 13000 (8000-20000) whereas it was INR 14000 (10000-20500) for the victims' total family.

Majority, 156 (92.3%) of the victims of road traffic accidents belonged to Hindu religion followed by 10 (5.9%) were Christians and 3 (1.8%) were Muslims. Nuclear family was observed to be common 148 (87.6%) among study subjects followed by joint family seen in 11 (6.5%) and remaining 10 (5.9%) belonged to other type of families.

The current study provided evidence that 54 (32.0%) had an expenditure (including both direct and indirect expenses) to meet the road traffic accident costs (Table 2).

Amongst the study individuals, 32 (18.9%) had spent for legal and administrative costs like toeing of vehicles, medico-legal case, payment to the traffic police as a result of road traffic accident. 133 (86.9%) had spent on vehicle damage among 153 study participants (excluding the sixteen pedestrian victims). However, only 5 (3%) had claimed vehicle insurance for the vehicle damage and the median (IQR) for the claimed amount was INR 3000 (6500-55000). Only 4 (2.4%) had an accident insurance that covered only accidental deaths in the study population.

It was noticed that 16 (9.5%) had borrowed money to meet the road traffic accident expenses. Among

those 16 victims, 11 (68.7%) had borrowed from their relatives while 5 (31.2%) had borrowed from their friends and furthermore 2 (1.1%) had sold their property. The median (IQR) amount of money borrowed from different sources like friends or relatives to meet the road traffic accident costs was INR 40000 (21250-67500).

The median (IQR) direct, indirect and total expenses were compared with the accident victims' socio-demographic determinants. This study provided evidence that the median (IQR) indirect expense was associated with only marital status and socio-economic status of the road traffic accident victims which was found to be statistically significant i.e.,  $p$ -value  $< 0.05$  (table 3). There was no significant association between the accident victims' socio-demographic determinants and median (IQR) of direct as well as total expenses towards the road traffic accident ( $p$ -value  $> 0.05$ ).

## DISCUSSION

The present study noticed that the mean (SD) age of the study participants was 36.2 (11.4) years. Majority of the study victims belonged to young and middle-aged population. This might be attributed to the fact that productive age group people tend to travel more than other age group people for work and other necessities. These findings were consistent with earlier studies.<sup>17-19</sup>

It was observed that the proportion of male accident victims were high in this study which was correlating with existing literature from.<sup>17-20</sup> Male dominance as road traffic accident victims could be attributed to the fact that males normally work outside the home and are the primary economic support for the family. Families face economic crisis when the primary economic earner is injured and hospitalized, leaving the family in a position where they need to spend money on treatment although their earnings have ceased or reduced.

In this study, around three-fourth of the accident victims were married, employed, educated at school level and belonged to upper socio-economic class. Similar results were reported in earlier studies.<sup>17,21-26</sup>

Among 169 accident victims, it was witnessed that only 32.0% had an expenditure (including both direct and indirect expenses) to meet the road traffic accident costs. Treatment costs were higher for road traffic accident injuries as it required prolonged hospital stay, specialized management and loss of working days due to the injury. However, the present study had only 16 serious injuries (hospitalization  $\geq 24$  hours due to the injury) amongst 169 victims and also the deaths due to road traffic accidents were excluded. Hence, the proportion of study subjects' expenditure towards management of road traffic ac-

cident cost was found to be very less compared to other studies.

Only the median (IQR) indirect expenses association with only marital status and socio-economic status of the road traffic accident victims was found to be statistically significant. The indirect expenses being more compared to the direct expenses in this study might be due to the fact that most of the study victims had preferred going to government facilities and in Puducherry the medications, procedures, hospital admissions in government facilities are completely free of cost when compared to some states of India, where the government facilities have minimal charges for medications, admissions and procedures.

A hospital-based cross-sectional study among road traffic accident victims, conducted at Agra, Uttar Pradesh, India, established that 74.8% of accident victims had spent INR  $>5,000$  on the treatment and 71.5% had lost their wages INR  $>1,000$ . 73.2% had incurred hospital expenses from 1 to 10 times or even more of their monthly family income.<sup>27</sup> A cross-sectional survey of all the road traffic crashes recorded by traffic police during 1-year duration in a union territory, Chandigarh, India documented that the total expenditure (direct and indirect costs together) incurred was INR 8,55,644 (\$19,991).<sup>28</sup>

Another study from Manila, Philippines has reported that the total expenses towards for road traffic accident cost for fatal injuries as PhP 3,472,008, for serious injuries PhP 734,867 and for simple injuries PhP 71,483.<sup>15</sup> A study from Thailand, recorded that the average cost for all types of accident injuries as 3,050,112 Baht per fatality, 193,648 Baht per serious injury, 25,400 Baht per slight injury, and 18,508 Baht per PDO (Property damage only) crash.<sup>29</sup>

In the current study only 54 study participants had expenditure to meet the road traffic accident costs, among those 54 accident victims the median (IQR) for direct expenses in this study was INR 1500 (1000-22100), the median (IQR) for indirect expenses was found to be INR 18000 (2400-46500) and the median (IQR) for total expenses was INR 3000 (1037-47125). These findings were very less compared to the other studies as the present study had only 9.5% serious injuries and fatal injuries were excluded. A study from Chandigarh, India has documented that the mean out-of-pocket expenditure (OOPE) for road traffic injury cases at the time of hospitalization was US\$ 400 (95% CI 344-456).<sup>30</sup> Another study from Hyderabad, Telangana, India reported that among the road traffic accident victims, the median OOPE for medical and non-medical expenditure was US\$ 169 and US\$ 163, respectively.<sup>31</sup>

Another study on traffic accidents in Spain generated direct and indirect costs totaling 6,280.36 million euros. The direct costs of traffic accidents were 3,397.00 million euros, representing 54.1% of the total costs. The indirect costs were 2,883.36 million euros, representing 45.9% of the total costs.<sup>32</sup> One another study from Barcelona, Southern Europe,

stated that the total costs of road traffic crashes in Barcelona were €367 million. Direct costs equaled €329 million (89.8% of total costs), including property damage costs, insurance administration costs and hospital costs. Police, emergency costs and transportation costs had a minimum effect on total direct costs. Indirect costs were €37 million, including lost productivity due to hospitalization and mortality.<sup>33</sup>

The present study revealed that among the 169 victims, 32 (18.9%) had spent for legal and administrative costs like towing of vehicles, medico-legal case, payment to the traffic police as a result of road traffic accident. In 169 participants, excluding the 16 pedestrians, among the remaining 153 accident victims, 133 (86.9%) had spent on vehicle damage as a result of road traffic accident. Again, these results were different from other existing studies as the present study had a greater number of simple injuries. A study from Chandigarh established that the total expenditure incurred was INR 8,55,644 (\$19,991) Medical costs and nonmedical costs constituted 43.6% and 53.4% of direct costs, respectively. More than half of the direct costs were attributed to vehicular repair, i.e., INR 4,77,300 (\$11,151).<sup>28</sup>

Vehicle repair cost calculated in Philippine that were for per fatal accident PhP 76,930 (Philippine Peso i: e 1 US\$=50 PhP). The cost of Vehicle repair per serious injury accident was PhP 45,647. The cost of vehicle repair per minor injury accident was PhP 40,756. The cost of vehicle repair per PDO (Property damage only) accident was PhP 33,257.<sup>22</sup> A study from Pakistan reported that cost of vehicle repair per fatal accident (PKR) 643654.6, cost of vehicle repair per serious injury (PKR) 364181.97 and cost of vehicle repair per minor injury (PKR) 13662.87.<sup>34</sup>

The present research showed that among 169 road traffic accident victims, only 2.4% were having an accident insurance which covered only accidental deaths. 13.6% were only covered under general health insurance. The low utilization of health insurances could be possibly because of the less awareness about the existing insurances and its benefits among the victims. Only 3% had claimed vehicle insurance for the damage of their vehicles due to the road traffic accident. This could be probably due to non-renewal of the vehicle insurances regularly by the victims.

Whereas in a study from Agra, Uttar Pradesh, India which had documented that among the road traffic accident victims only 3.5% had health insurance covering their hospital expenses and only 8.8% had vehicle insurance (other than third party) for reimbursement of their losses.<sup>27</sup> Another study from Hyderabad, India noticed that 22% of the accident victims had access to medical insurance.<sup>31</sup>

This study had shown that 9.5% had borrowed money to meet the road traffic accident expenses. Out of those 16 borrowed, 11 (68.7%) had borrowed from their relatives and 5 (31.2%) had borrowed from

their friends. 2 (1.1%) had sold their property to meet the road traffic accident costs and those 2 also come in the 16 victims (12.5%) who had borrowed money in order to meet the accident expenses. Whereas, in another study from Hyderabad, the prevalence of distress financing was 69% with it being significantly higher for those reporting to the public hospitals, those belonging to the lowest per capita annual household income quartile, and for those without insurance access.<sup>31</sup>

The strength of the study is that it is one among the few community-based studies done on road traffic accident victims which gives us the true estimates of the road traffic accidents. The study design being a longitudinal study, helped in assessing the road traffic accident victims over a period of time by two follow-ups at 6 months and 12 months from the day of accident. Both direct and indirect costs were adopted for calculating catastrophic costs to derive estimates that can be compared with other studies.

The limitations of the study were only 169 accident victims and also households from only six selected wards were included in the study. Hence, the results obtained from this study can't be generalized. In this study, the administrative and legal costs, vehicle repair costs were not taken into consideration for the calculation of indirect cost. Only the travel costs of victims and care-takers, food expenses during hospitalization, loss of wages (if any) were included for computing the indirect cost towards accidents. The deaths due to road traffic accidents were excluded from the present study as they could not be followed up for assessing the economic burden.

## CONCLUSION

Majority of the accident victims were productive population belonging to lower- and middle-class income group and proportion of males was high among the accident victims. Evidence showed that most of the time it was the main income earner being the victim of the road traffic accident, which resulted in their family facing unbearable problems. This study reported the financial burden borne only by the victims and their family. In addition, the government bears the cost of health professionals, related interventions as required, hospital accommodations, basic medicines and other services. As such, the management of road traffic accidents represents a huge economic issue for the nation as well. The socio-economic status and marital status were found to be associated with median (IQR) indirect expenditure towards road traffic accident cost by the victims.

There is a need for implementation of evidence-based and cost-effective strategies to reduce the burden of road traffic accident costs. More community-based research in this field is warranted for providing in-depth information on this topic and to aid in framing short- and long-term measures to min-

imize the economic burden on victims and households due to road traffic accidents.

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