

## Factors Associated with Driving Behavior and Road Traffic Accidents among Public Vehicle Drivers in Kathmandu Valley: A Cross-sectional Study

Suraj Bhushal<sup>1</sup>, Bishnu P Choulagai<sup>2</sup>, Rakshya Niroula<sup>3</sup>, Ambika Thapa Pachya<sup>1</sup>

<sup>1</sup>Department of Community Health Sciences, Patan Academy of Health Sciences, Lalitpur, Nepal

<sup>2</sup>Central Department of Public Health, Institute of Medicine, Tribhuvan University, Kathmandu, Nepal

<sup>3</sup>Program Support Team, United Mission to Nepal, Kathmandu, Nepal

### ABSTRACT

**Introduction:** Vehicle drivers are most significant stakeholder in any road traffic accident (RTAs). This study aims to assess their knowledge related to traffic signs and attitude towards safe driving practices and to identify self-reported risky driving behaviors, their encounter of RTAs, and their associated factors.

**Methods:** We carried out a cross-sectional study in Kathmandu valley where 14 prime spots were randomly selected and time location sampling was done. Face to face interview was done with public vehicle drivers using pretested structured questionnaire. We analyzed the association using logistic regression. Ethical clearance was obtained from Institute of Medicine. Informed written consent was taken the participants.

**Results:** Of 411 public vehicle drivers, mean age was 31.8 ( $\pm 8.2$ ) years. All participants were male of which 71.0% lived in a joint family. More than half had less than 10 year experience and 20% of them were driving 12-18 hours per day. Half of them had good knowledge on traffic signs while nearly one tenth had non-supportive attitude towards safe driving practices. Prevalence of at least one risky driving behavior was 68%, however, only a few cases had been caught and fined by traffic. Self-reported encounters of RTA were 21.7%; of these, 22.2% also had human injuries. Experiences of driving less than 10 years and living in a nuclear family were significantly associated with risky driving. Moreover, age of public vehicle drivers less than 25 years, living in nuclear family and continuing driving while fatigue were also significantly associated with RTAs.

**Conclusion:** Only half of drivers had good knowledge on traffic signs. Risky driving behavior present in about seven among ten public vehicle drivers and two among ten encountering RTAs. We recommend interventions targeted to change behavior among drivers to reduce risky driving behaviors, to increase age bar for permitting driving license for public vehicles and not continuing driving while fatigue to reduce RTAs.

**Keywords:** Road traffic accidents drivers, Traffic, Driving behaviors, Kathmandu

### INTRODUCTION

Road traffic accidents (RTAs) are among the leading causes of unnatural deaths, morbidities and disabilities.<sup>1</sup> Global share of RTAs accounts to 1.35 million of death tolls with road traffic injuries affecting people of age 5-29 years; as a major killer.<sup>2</sup> Lower and middle income countries make a share of around 60% of the world's total registered vehicles while 90% of the world's crash deaths occur here.<sup>2</sup> More than 85% of all deaths and 90% of disability adjusted life years were lost from road traffic injuries in developing countries.<sup>3</sup> The seriousness of problem can be felt in the notion that not a single day passes without a RTA.<sup>4</sup>

Despite of being a pertinent preventable cause of this loss, absolute control of RTAs has not been established as it involves multi-dimensional factors of causation.<sup>5</sup> Study shows that drivers were found to have risky driving

behavior and thus encountered RTAs.<sup>6</sup> While there is very little known about the driving behaviors among public vehicle drivers in Nepal.<sup>7-9</sup> Every year more than 5,500 accidents occur in Kathmandu Valley causing more than 180 deaths.<sup>9</sup> A study done in Kathmandu Valley in Nepal also showed that public vehicles-like bus (10.51%) and microbus (5.89%) are attributable to RTAs.<sup>8</sup> Thus, the study was carried out among public vehicle drivers in Kathmandu Valley to assess their knowledge related to traffic signs and attitude towards safe driving practices, and to identify self-reported risky driving behaviors, their encounter of RTAs and their associated factors. The study findings may help

**Correspondence:** Suraj Bhushal, Department of Community Health Sciences, Patan Academy of Health Sciences, Lalitpur, Nepal, Email: [surajbhushal@pahs.edu.np](mailto:surajbhushal@pahs.edu.np)

to generate evidence for preventive aspects of RTA tailored for public vehicle drivers in Kathmandu Valley.

## METHODS

This was a cross-sectional study done in Kathmandu Valley. The study was carried out from October 2014 to March 2015. Population of study included all the public vehicle drivers. There is very little known about the driving behaviors among public drivers in Nepal, so sample size was calculated using single proportion formula at 95% confidence interval (CI) and 50% prevalence and non-response of seven percent. The calculated sample size was 411. Data from Vehicle Management Committee Office and Driver's Association Office was used to locate bus parks operational within the Kathmandu of which 14 prime spots were randomly selected. Drivers were met at different locations at specific time in these identified prime spots. Time location sampling (TLS) was used involving sampling persons at different times and locations till sample size was reached.

Data was collected through face to face interview using pretested structured questionnaire which included socio-demographic characteristics, knowledge and attitude towards risky driving behavior and episodes of RTA encountered in past two years by the participants. Participants were given time to recall events and probing was done to reduce the recall bias in the study. Knowledge of participants was assessed regarding ten important traffic signs. Respondents answering correctly to at least eight signs were categorized as having good knowledge. Similarly, participants answering correctly to five to seven answers were categorized as medium and those answering to less than five answers correctly were categorized as having poor knowledge level. Attitude of participants was assessed related to safe driving practices- fastening seat belt while driving, no drunk and drive, no use of mobile phone while driving, no driving while feeling fatigue and no close chasing. Participants scoring more than three points were regarded as having supportive attitude while those scoring less than or equal to three were regarded as having non supportive attitude towards safe driving practices.

Data was checked manually for completeness and entered in EpiData 3.1 Version, Odense Denmark, EpiData Association and was analyzed using Statistical Package for Social Sciences (SPSS) version 17, Chicago, SPSSInc.. Both descriptive and inferential statistics were calculated. Odds ratio (OR) (95% CI) was used to find out significance of association. Statistically significant variables during bivariate analysis with variance Inflation Factor (VIF) less than 10 were further taken for multivariate analysis of

logistic regression model. Hosmer and Lemeshow test was used to test goodness of fit of the logistic regression model.

Ethical clearance for the study (Ref:107(6-11-E)/071/072) was obtained from Institutional Review Board of Institute of Medicine; Tribhuvan University and permission was obtained from traffic office and Buspark Management Committee. Participants were clearly stated about the objective of study and that there was no direct benefit participating in the study. Informed written consent was obtained and they were informed about the voluntary nature of participation. Anonymity and confidentiality of participants was maintained throughout the study. The study includes only the public vehicle drivers. So, the findings may not be generalized for private vehicle drivers.

## RESULTS

### Socio-demographic information of participants

A total of 411 public vehicle drivers were interviewed in the study; 176 (42.8%) drove passenger bus (Table 1). The mean age and standard deviation (SD) was 31.8 ( $\pm$ 8.2) years. All participants were male of which 354 (86.0%) were married and 292 (71.0%) lived in joint family. Among the participants, 157 (36.0%) were Brahmins and Chhetris, 141 (34.0%) were from relatively advantaged Janajati, 110 (26.0%) were relatively disadvantaged Janajati and 13(3.2%) were Dalits. All of them could read and write; 135 (33.0%) had completed lower secondary level and 127 (31.0%) had secondary level.

Participants' experience of driving ranged from less than 10 years to more than 30 years; with more than half (56.4%) having experience of less than 10 years. They had routine practice of driving with a range of less than 6 hours to 18 hours of driving per day; 20% drove from 12-18 hours per day. The profession yielded monthly income ranging from less than NRs. 5,000 to more than NRs. 15,000; 220 (53.5%) of them earned more than NRs. 15,000 from this profession. Majority of them, 323 (78.6%) didn't have ownership of the vehicle and used to ride rental/lease vehicles (Table 1).

Table 1: Driving experience, driving hours per day, type of vehicle and ownership of vehicle among the public vehicle drivers

Characteristics	Number (n=411)	Percentage
<b>Duration of driving in years</b>		
Less than 10	232	56.4
10-20	138	33.6
20-30	37	9.0
Above 30	4	1.0

<b>Driving hours per day</b>		
0-6	49	11.9
6-12	280	68.1
12-18	82	20.0
Mean ± SD (10.3 ±2.8)		
<b>Type of vehicle</b>		
Bus	176	42.8
Microbus	162	39.4
Minibus	73	17.8
<b>Ownership of vehicle</b>		
Own	88	21.4
Others	323	78.6

**Knowledge and attitude of participants on traffic signs**

Half (50.4%) of the participants had good knowledge on traffic signs (Table 2).Traffic signs related to no parking (96.8%), maximum speed 40km/hr (89.5%), pedestrian crossing (85.2%), no right turn (82.2%), and road hump (82.7%) were correctly identified by participants. Among the participants, 243 (59.1%) couldn't identify traffic sign related to no overtaking, 219 (53.2%) couldn't identify stop and give way and 184 (44.7%) couldn't identify four-way intersection ahead, 142 (34.5%) couldn't identify no entry and 121 (29.4%) couldn't identify road narrow on both sides. Less than one tenth (9.7%) of participants had non-supportive attitude towards safe driving practices

Table 2: Knowledge on traffic signs and attitude towards safe driving practices

Characteristics	Number (n=411)	Percentage
<b>Knowledge on traffic signs</b>		
Good	207	50.4
Medium	144	35.0
Poor	60	14.6
<b>Attitude towards safe driving practices</b>		
Supportive	371	90.3
Non supportive	40	9.7

**Prevalence of risky driving behavior among participants**

Sixty-eight percent of participants were found to have done at least one of the risky driving behaviors in last twelve months prior to survey. Unfastening seat belt while driving was found among 190 (46.2%), using mobile phone while driving among 145 (35.3%), continued driving while feeling fatigue among 95 (23.1%), close chasing among 97 (23.6%), drink and drive among 14 (3.4%) participants. Among those reporting to have close chasing, the reasons of close chasing were- to overtake in 39 (40.2%), traffic jam in 31 (32.0%), hurry in 25 (25.8%) and for fun in 2 (2.1%) cases.

**Self- reported traffic fines/charges and road traffic accident**

No participant reported to face traffic fines and RTA due to unfastening of seat belts. Among 14 participants, four (28.6%) reported to face traffic fines for drink and drive and one of them (7.1%) met an RTA due to it. Similarly, among 145 participants who used mobile while driving, 22(15.2%) reported to face traffic fines and one of them (0.7%) met RTA due to it. Further, there were two (2.1%) self-reported RTA cases due to driving while feeling fatigue. And two (2.1%) reported RTA due to close chasing.

Also, in the period of last twenty four months before data collection, 89(21.7%) reported to have encountered RTA while driving public vehicle. Among them, 68(76.4%) had encountered RTA once, 14(15.7%) encountered RTA twice and 7(7.9%) encountered it thrice in last twenty four months. In these RTAs, physical damage to vehicle was caused in 85 (95.5%) and human injuries in 20(22.2%) of cases.

**Factors associated with risky driving behavior**

During multivariate analysis, factors like- experience of driving less than 10 years (AOR=1.772, CI: 1.047-2.997), living in nuclear family (AOR= 2.288, CI: 1.134-3.984) were significantly associated with risky driving. Driving Microbus in comparison to minibus was found protective in case of risky driving behavior (Table 3). The model was fit as shown by Hoamer and Lemeshow test (p-value = 0.183) as it is larger than 0.05. The predictability of regression equation was 70.3%.

**Factors associated with road traffic accident**

During multivariate analysis, factors like- age of public vehicle drivers less than 25 years (AOR=2.075, CI: 1.026-4.197), living in nuclear family (AOR= 2.047, CI: 1.181-3.550) and not continuing driving while fatigue (AOR= 0.550, CI: 0.311-0.970) were significantly associated with RTA (Table 4). The model was fit as shown by Hosmer and Lemeshow test (p value = 0.345) as it is larger than 0.05. The predictability of regression equation was 79.8%.

Table 3: Multivariate analysis for factors associated with risky driving behavior

Characteristics	Risky driving behavior		UOR (95% CI)	AOR (95% CI)
	Yes Number (%)	No Number (%)		
<b>Driving experience in years</b>				
Less than or equal to 10	55 (26.44)	153 (73.56)	0.799 (0.526-1.212)	1.977 (1.137-2.997)
More than 10	76 (37.44)	127 (62.56)	Reference	Reference

<b>Type of family</b>				
Nuclear	93 (80.17)	23 (19.83)	2.335 (1.396-3.905)	2.325(1.304-4.145) Reference
<b>Marital status</b>				
Married	244 (68.93)	110 (31.07)	1.294(0.722-2.319)	1.814 (0.873-3.771) Reference
Unmarried/Single	36 (63.16)	21 (36.84)	Reference	Reference
<b>Type of vehicle</b>				
Bus	143 (81.25)	33 (18.75)	1.525(0.800-2.907)	1.667(0.835-3.328)
Microbus	83 (51.23)	79 (48.77)	0.37(0.201-0.678)	0.417 (0.215-0.809) Reference
Minibus	54 (73.97)	19 (26.03)	Reference	Reference
<b>Education</b>				
Below secondary	156 (63.16)	91 (36.84)	0.553(0.356-0.859)	Reference
Secondary and above	124 (75.61)	40 (24.39)	Reference	
<b>Religion</b>				
Hindu	234 (68.42)	108 (31.58)	1.083(0.625-1.878)	Reference
Non-Hindu	46 (66.67)	23 (33.33)	Reference	
<b>Ethnicity</b>				
Dalit	9 (69.23)	4 (30.77)	0.87(0.254-2.983)	0.58(0.343-0.981)
Relative disadvantaged janajati	66 (60)	44 (40)	0.912(0.547-1.518)	Reference
Relatively advantaged janajati	99 (70.21)	42 (29.79)	Reference	
Brahmin/Chhetri	106 (72.11)	41 (27.89)	Reference	
<b>Ownership of vehicle</b>				
Own	64 (72.73)	24 (27.27)	1.312(0.783-2.229)	Reference
Others	216 (66.87)	107 (33.13)	Reference	
<b>Knowledge of traffic signs</b>				
Good	148 (71.50)	59 (28.50)	1.918 (1.060-3.471)	1.629(0.877-3.026)
Medium	98 (68.06)	46 (31.94)	Reference	
Poor	34 (56.67)	26 (43.33)	Reference	
<b>Attitude towards safe driving behavior</b>				
Non-supportive	32 (80)	8 (20)	1.984(0.888-4.434)	Reference
Supportive	248 (66.85)	123(33.15)	Reference	

Note: Adjusted for age, ownership of vehicle, driving hours, knowledge, attitude

Table 4: Multivariate analysis of factors associated with road traffic accident

Characteristics	Risky driving behavior		UOR (95% CI)	AOR (95% CI)
	Yes Number (%)	No Number (%)		
<b>Age</b>				
Less than or equal to 25	27 (30)	63 (70)	1.790 1.055-3.039)	2.075 (1.026-4.197)
More than 25	62(80.69)	259 (19.31)	Reference	Reference

<b>Type of family</b>				
Nuclear	37 (68.10)	79 (31.90)	2.189(1.338-3.580)	2.047 (1.181-3.550)
Joint	52 (1.40)	243 (78.60)	Reference	Reference
<b>Continued driving while feeling fatigue</b>				
No	60 (18.99)	256 81.01)	0.533 0.317-0.897)	0.550 (0.311-0.970)
Yes	29 (30.53)	66 (69.47)	Reference	Reference
<b>Education</b>				
Below secondary	52 (21.05)	195 78.95)	0.915 0.568-1.475)	
Secondary and above	37 (22.56)	127 77.44)	Reference	
<b>Marital status</b>				
Married	76 (21.47)	278 78.53)	0.925 0.474-1.806)	
Unmarried/Single	13 (22.81)	44 ((77.19)	Reference	
<b>Religion</b>				
Hindu	75 (21.93)	267 (78.07)	1.104 0.582-2.093)	
Non-Hindu	14 (20.29)	55 (79.71)	Reference	
<b>Ethnicity</b>				
Dalit	2 (15.38)	11(84.62)	0.680 0.143-3.231)	
Relatively Disadvantaged janajati	28 (25.45)	82 (74.55)	1.278 0.713-2.291)	
Relatively advantaged janajati	28 (19.86)	113 80.14)	0.927 (0.523-1.644)	
Brahmin/Chhetri	31 (21.09)	116 (78.91)	Reference	
<b>Type of vehicle</b>				
Bus	39 (22.16)	137 (77.84)	1.014 0.525-1.960)	
Microbus	34 (20.99)	128 (79.01)	0.946 0.484-1.851)	
Minibus	16 (21.92)	57 (78.08)	Reference	
<b>Driving Hours</b>				
Less than or equal to 10	48 (23.08)	160 (76.92)	1.185 0.740-1.898)	
More than 10	41 (20.20)	162 (79.80)	Reference	
<b>Driving Years</b>				
Less than or equal to 10	60 (45.45)	172 54.55)	1.804 1.101-2.958)	
More than 10	29 (16.20)	150 83.80)	Reference	
<b>Ownership of vehicle</b>				
Own	18 (20.45)	70 (79.55)	0.913 0.510-1.632)	
Others	71 (21.98)	252 78.02)	Reference	
<b>Knowledge</b>				

Good	50 (24.15)	157 (75.85)	1.274 0.627-2.586)
Medium	27 (18.75)	117 (81.25)	0.923 0.432-1.971)
Poor	12 (20)	48 (80)	Reference
<b>Attitude</b>			
Non-supportive	12 (30)	28 (70)	1.636 0.795-3.366)
Supportive	77 (20.75)	294 (79.25)	Reference
<b>Unfastening seatbelt</b>			
No	40 (18.10)	181 (81.90)	0.636 0.397-1.020)
Yes	49 (25.79)	141 (74.21)	Reference
<b>Drink and drive</b>			
No	86 (21.66)	311 (78.34)	1.014 0.277-3.716)
Yes	3 (21.43)	11 (78.57)	Reference
<b>Use of mobile phone</b>			
No	48 (18.05)	218 (81.95)	0.559 0.346-0.901)
Yes	41 (28.28)	104 (71.72)	Reference
<b>Closely chasing other vehicle</b>			
No	62 (19.75)	252 (80.25)	0.638 0.378-1.077)
Yes	27 (27.84)	70 (72.16)	Reference

Note: Adjusted for ownership of vehicle, vehicle type, driving years, driving hours, knowledge, attitude, risky driving behaviors

## DISCUSSION

The study was done among 411 public vehicle drivers in Kathmandu Valley. Only half had good knowledge on traffic signs. One in ten drivers had unsupportive attitude towards safe driving practices while in practice there were around seven in ten drivers who were doing at least one of the risky driving behaviors. The odds of RTA increased with age of drivers less than 25 years and belonging to nuclear family.

In this study all participants were male while there were certain female public vehicle drivers in other studies.<sup>10</sup> The differences may be due to the trend of male public vehicle drivers in Nepal and being taken as risky and frequent travelling females are not encouraged for public vehicle drivers while there are some female helpers working in the local route vehicles in Kathmandu valley.

In this study, only half of participants had good knowledge on traffic signs. Such gap in knowledge leads to an unintentional violation of traffic signs which further lead to RTA. Trade unions and government bodies should be

implementing routine and refresher trainings to public vehicle drivers to keep their knowledge abreast related to traffic signs.

Less than one tenth of the participants had non-supportive attitude towards safe driving practices and sixty-eight percent of participants were found to have done at least one of risky driving behaviors in last twelve months before survey. The participants with non-supportive attitude were 2.090 times more likely to have risky driving behavior. This finding was similar to the cohort study done in France where risky behavior with increased risk road traffic crashes were likely to have negative attitude towards traffic safety was associated with risky behavior. Similar to the cohort study, in our study too it is difficult to establish the temporality of the association of the attitude and behavior as the assessment of behavior was retrospectively assessed for past twelve months from the time of survey.<sup>11</sup> We recommend interventions targeted to change behavior among drivers to reduce risky driving behaviors to be implemented with involvement of the stakeholders to design the program.

Among self reported RTAs in this study, there were 20 out of 89 RTAs (22.2%) with human injuries. Most of the data in different studies consider RTAs only with human injuries making tolls of RTA.<sup>9,12</sup> This can be tip of iceberg to relate to total RTAs that are actually occurring because every RTA without human injury may not be reported.

Among drink and drive cases, 28.6% reported to face traffic fines for drink and drive and one of them met an RTA due to it in last twelve months. The association of drink and drive was statistically not significant in our study which could be due to less number of the sample for the sub-analysis for drink and drive and RTA. However, drink and drive increases risk of accidents due to effect of alcohol on abilities of judgment, vigilance, recognition, reaction, and controlling of the drivers were impaired.<sup>13</sup> Nepal has been implementing strict rules for drink and drive control and we recommend continuity of such rules.

In our study risky driving behaviors of unfastening seat belts and use of mobile phones were prevalent among 46.2% and 35.3% of the participants. The association of these risky driving behavior was not seen to be statistically associated with RTAs in our study. This could be because there were no cases facing RTA due to unfastening seat belts and only one case facing RTA due to mobile phone use in our study. However, study done in Congo show that unfastening seat belts were seen to have 1.85 ( $\pm 0.062$ ) times odds of occurrence RTA-related fatality.<sup>14</sup> And study

done in Iran show that using mobile phones during driving have 9.4 times higher chance of RTA than those not using mobile phones while driving.<sup>15</sup>

In this study, routine practice of driving was in a range of less than 6 hours to 18 hours of driving per day and one fifth drove from 12-18 hours per day. This study also showed that not continuing driving while fatigue is protective. Driving while feeling fatigue increases risk of RTA.<sup>16</sup> Having at least two drivers in the long routes of public vehicles in Nepal has potential to reduce RTAs.

In this study lower age group had increased odds of RTA as compared to higher age group (>25 years). The finding is consistent with the finding of study done in Palpa, Nepal.<sup>17</sup> This is a worrisome state as there is no specific age bar set separate for being eligible for public vehicle driving. Existing age bar needs to be increased for allowing public vehicle driving.

Also, public vehicle drivers with less experience of driving (less than 10 years) have increased odds to have risky driving behaviors. This was similar to the finding of the study done in Ethiopia where inexperienced drivers are more indulged in risky driving behavior.<sup>18</sup>

In this study microbus driver were found to have less risky driving behavior as compared to minibus. The similar comparison has not been done in the past studies related to risky driving behavior.<sup>17,18</sup> The difference seen in our study could be due to the relatively longer routes of the minibus than microbus in our setting.

Living in nuclear family was significantly associated with both risky driving behavior and encountering RTA. This variable has not been explored in other literature though studies are done in lifestyle and its relation to RTAs.<sup>19,20</sup> We assume that this might have been due to decreased sense of responsibility and increased sense of freedom when people live in nuclear families in our context. But actual reasons for how nuclear family setting increased odds of risky driving behavior as well as RTAs need to be explored.

## CONCLUSION

Among public vehicle drivers, still half of them did not have good knowledge. There were one in ten drivers who had unsupportive attitude towards safe driving practices while in practice there were around seven in ten drivers who were doing at least one of the risky driving behaviors. The cases being fined by traffic police were only in few occasions. More than two in ten drivers had encountered RTAs and the odds of RTA increased twice with age of

drivers less than 25 years. On the good note it was seen that not continuing driving while fatigue would help prevent RTAs. We recommend interventions targeted to bring behavioral change among drivers to reduce risky driving behaviors, increase age bar for permitting driving license for public vehicles and not continuing driving while fatigue to reduce RTAs. The reasons for how nuclear family setting increased odds of risky driving behavior as well as RTAs need to be explored.

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