



Traffic Rule Violation: A Weak Link in Prevention of Road Traffic Accidents

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Abstract

Context: Road traffic accident in India is increasing despite recent legislative amendments, awareness programs and enforcements of traffic rules. Road users' behavior has been found to be the primary reason of accidents in 70%-95% of cases. We planned this preliminary study to evaluate behavior of local population with regards to traffic rule violations.

Methods: Study was conducted at campus of our Institute, which is situated in the capital city of Delhi. A questionnaire of 21 questions, to evaluate various aspects of human behavior, was formulated. People who used to drive two and/or four wheelers on Delhi roads were included in the study. Patients and employee of the institute were excluded. Answers were evaluated based on age, gender, educational levels, type of vehicle (two or four wheeler) driven, and residence (Delhi or outside Delhi). Tendency to Violate Traffic Rules Under Stress (VTRS) and Low Frustration Tolerance (LFT) were evaluated for each group.

Results: A total of 52 participants' filled up questionnaire were examined and evaluated. It included 43 (83%) males and 9 (17%) females with average age of 34 years (range 20 to 56). Younger drivers and those who used to drive motorized two and/or four wheelers had more VTRS and LFT.

Conclusion: Population based road users' behavior needs to be studied for understanding cause of increase in road traffic accidents in India. Trauma care personnel and behavior scientists/therapists should work together to find out effective ways to prevent RTA.

Keywords: Road traffic accident; Human behavior; Traffic rule; Road rage; Prevention

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Introduction

Role of human behaviour has been elucidated in Road Traffic Accidents (RTA) since early 1980s [1,2]. Most of the legislations like use of helmets for pillion riders and seat belts for cars were implemented around the world during that period [3]. Literature in the field of behaviour studies regarding traffic rule violations suggest role of human behaviour as a cause of road traffic accidents in 70% to 95% cases [1,3]. Steps taken for prevention, like legislations enforcing traffic rules and awareness campaigns, indirectly change human behaviour, but direct interventions to change human behaviour need evaluation of the behaviour of the population of a specific area. Such studies have been conducted in different parts of the world including some cities of India too, but academic research alone is least likely to prevent RTA [1,3-9]. Need of the hour is comprehensive evaluation of population with the purpose of identifying behaviour patterns of people and interventions as per the findings of these studies especially in low income countries like India where vehicular population and RTA are increasing at a fast pace. We conducted a pilot study to screen a sample population to get an idea of the behaviour problems related to traffic rule violations so that a structured study can be designed for the purpose of identification of a target population who need some sort of intervention to prevent their involvement in RTA.

Material and Methods

The study was carried out at the campus of our institute, which is situated at Delhi, the capital city of India. Study was done in the first week of August' 2016. Study included persons above 18 years of age who drives either or both two or four wheeler vehicle on the Delhi roads. Patients and employees of the institute were excluded from the study. For the purpose of evaluation of various aspects of

Questionnaire		Serial number:		
Name:		Educational qualification:		Occupation:
Vehicle:		Residence:		
<p>We want to know your views about traffic rules. Below are few questions related to traffic situation of Delhi. Two or three options have been given for each question. You have to opt one answer. Any answer, whether right or wrong, the purpose is only to know your personal opinion.</p>				
Please choose one answer.				
1.	How difficult it is to drive at Delhi?	Somewhat	Difficult	Very difficult
2.	Do people follow traffic rules?	Somewhat	Commonly	Almost always
3.	Do People Know Traffic Rules?	Somewhat	Commonly	Almost always
4.	Do people give way to pedestrian / non-motor vehicle?	Somewhat	Commonly	Almost always
5.	Do people stop at red light?	Somewhat	Commonly	Almost always
6.	Do people drive fast?	Somewhat	Commonly	Almost always
7.	How many road accidents have you seen so far?	Somewhat	Many	Too many
8.	How many road accidents you have met with?	Few	Many	Too many
Over the last two weeks, how many people you have seen				
9.	Have you seen people violating red light signal?	Somewhat	Commonly	Almost always
10.	Have you seen people stopping their vehicles beyond zebra crossing?	Somewhat	Commonly	Almost always
11.	Have you seen people driving fast?	Somewhat	Commonly	Almost always
12.	Have you seen pedestrian/non-motor vehicles violating traffic rules?	Somewhat	Commonly	Almost always
13.	When people are getting late, should they stop at red light?	Yes		No
14.	Should pedestrians/cyclist follow traffic rules?	Yes		No
15.	Should people drive within speed limit, when there is no traffic on the road?	Yes		No
16.	Should people wear helmets/seat-belts even for a short distance?	Yes		No
What will you do when				
17.	You are hungry and there is a delay in the cooking of food?	Wait	Will not eat	Will get angry
18.	You are in a queue for tickets and someone pushes to come in front of you?	Let go	Will quarrel	Will request
19.	You need to go somewhere and the auto-driver is asking for more money?	Will give	Will quarrel	Will request
20.	The driver of a vehicle behind your vehicle is blowing on the horn continuously?	Let go	Will shout	Will request
21.	Which type of activities give you thrill?	Nothing	Play games	Speed drive
Consent:				
<p>I give my consent to participate in the research study related to the traffic rules. I give my consent to use the information given by me for research purposes. I have been told that my identity will not be disclosed.</p>				
Date:			Signature	

Questionnaire-E:

human behaviour with regards to traffic rules, we formulated a set of questionnaire in local language (Hindi) consisting of 21 questions in three groups. (Questionnaire-H) First two groups had eight questions each and the third group had five questions. It also included informed

consent for participation in the study. Each participant had to fill up their name, age, education, residence and the vehicle/s they drive on the roads of Delhi. Participants had to mark one out of 2 or 3 answers for each question on the questionnaire sheet provided to

Table 1: Answers to the questions of the questionnaire by the participants with their percentage with high risk answers in shaded cells.

Q No:	Section I: Knowledge and perception of participants about Delhi traffic			
	Questions	No. of answers (%)		
		A1	A 2	A 3
1	How difficult is it to drive in Delhi?	07 (14)	20 (38)	25 (48)
2	Do people follow traffic rules?	43 (82)	06 (12)	03 (06)
3	Do People Know Traffic Rules?	29 (56)	14 (27)	09 (17)
4	Do people give way to pedestrian / non-motor vehicle?	45 (86)	06 (12)	01 (02)
5	Do people stop at Red light?	25 (48)	22 (42)	05 (10)
6	Do people drive fast?	07 (14)	24 (46)	21 (40)
Section II: Witnessing of experiencing RTA				
	Questions	A1	A 2	A 3
7	How many road accidents have you seen so far?	29 (56)	21 (40)	02 (04)
8	How many road accidents you have met with?	47 (90)	04 (08)	01 (02)
Section III: Observations of participants about following traffic rules				
	Questions	A1	A 2	A 3
9	Have you seen people violating red light signal?	19 (37)	12 (23)	21 (40)
10	Have you seen people stopping their vehicles beyond zebra crossing?	11 (21)	23 (44)	18 (35)
11	Have you seen people driving fast?	06 (12)	22 (42)	24 (46)
12	Have you seen pedestrian/non-motor vehicles violating traffic rules?	17 (32.5)	18 (35)	17 (32.5)
Section IV: Tendency of participants to violate traffic rules under stressful situations				
	Questions	A 1	A 2	
13	When people are getting late, should they stop at red light?	51 (98)	01 (02)	
14	Should the pedestrian / cyclist follow traffic rules?	47 (90)	03 (06)	
15	Should people drive within speed limit, when there is no traffic on the road?	49 (94)	03 (06)	
16	Should people wear helmets / seat belts for a short distance?	49 (94)	03 (06)	
Section V: Level of Frustration Tolerance among participants				
	Questions	A1	A 2	A 3
17	You are hungry and there is a delay in the cooking of food?	40 (76)	02 (04)	10 (20)
18	You are in a queue for tickets and someone pushes you to come in front of you?	01 (02)	14 (28)	37 (70)
19	You need to go somewhere and the auto-driver is asking for more money?	05 (10)	10 (20)	37 (70)
20	A driver of a vehicle behind your your vehicle is blowing on the horn continuously?	25 (48)	07 (14)	20 (38)
21	Which type of activities give you thrill?	10 (20)	40 (76)	02 (04)

Q No: question number; A: answer number as per the questionnaire.

them. Those who could not understand the Hindi script, questions were interpreted in English or their own language (Questionnaire-E). Data from all the questionnaires were compiled in tabular form (by CBT) in Excel worksheet and evaluated for further analysis by clinical psychology personnel (VS and NG). For the purpose of analysis, 21 questions were grouped in five 'sections' (Table 1) to assess various aspects of the behaviour of the participants which are as follows:

Section I: First five questions to assess 'Knowledge and Perception of participants about Delhi Traffic'.

Section II: Two questions to assess 'Witnessing or experiencing RTA'.

Section III: Four questions to assess 'Observations of participants about following traffic rules'.

Section IV: Four questions to assess 'tendency to Violate Traffic Rules under Stressful situations' (VTRS).

Section V: Last five questions to assess 'Level of Frustration

Tolerance among participants' (LFT).

Participants had to select one option only from the answers provided against each question. Questions of sections IV were given 2 options whereas 3 options were provided for the rest of the questions. Participants had to select either 'yes' or 'no' as answers of 4 questions of section IV, which were related to VTRS. Out of the three answers of each of the 5 questions of section V, 1 option was agreeing to behave violently to different daily life situations suggestive of LFT. Participants agreeing to VTRS (Section IV) or behave violently to situations given in Section V, were considered as 'high risk group' (HRG) and these answers were 'high risk answers'.

Answers of all 21 questions were analyzed based on:

1. Age of ≤ 40 years and more than 40 years
2. Gender i.e., male vs. females
3. Educational qualification {up to higher secondary (HS) versus above HS i.e., graduate and post-graduate (PG)}.

Table 2: High risk group participants' characteristics and their answers to questions of sections IV (VTRS) and Section V (LFT) of the questionnaire with high risk answers in shaded cells.

P No:	Age	Education	Sex	Section-IV: VTRS				Section V: LFT				
				A 13	A 14	A 15	A 16	A 17	A 18	A 19	A 20	A 21
2	21	G	M	1	1	1	1	1	3	1	2	2
3	28	G	M	2	1	2	1	1	3	2	2	2
4	28	PG	M	1	2	1	1	1	3	1	2	1
8	28	HS	M	1	1	1	1	3	2	3	2	3
9	30	G	F	1	1	1	1	3	2	3	1	1
10	35	G	M	1	2	1	1	1	3	3	1	2
12	32	G	M	1	2	1	1	1	3	3	3	2
15	30	HS	M	1	1	1	1	3	2	3	1	1
17	25	HS	M	1	2	1	1	2	2	3	3	1
22	40	G	M	1	1	1	1	3	2	2	3	2
23	32	G	M	1	1	1	1	3	3	1	1	2
24	32	G	M	1	1	1	1	3	2	2	1	2
25	32	HS	M	1	1	1	1	1	2	1	1	2
30	22	G	M	1	1	1	1	1	2	2	1	2
32	37	M	M	1	1	2	2	3	3	3	1	2
33	21	G	M	1	1	1	2	1	2	3	1	2
38	45	PG	M	1	1	1	1	1	2	2	1	2
39	40	PG	M	1	1	1	1	1	2	2	2	2
40	26	PG	M	1	2	1	1	2	2	2	2	2
41	27	PG	M	1	1	1	1	1	2	2	3	2
42	32	M	M	1	1	2	2	3	3	3	3	2
44	22	M	M	1	1	1	1	3	3	2	2	3
48	37	M	M	1	1	1	1	1	2	2	3	2
50	25	G	F	1	1	1	1	3	1	3	1	2

VTRS: Tendency to violate traffic rules under stressful situation; LFT: Low frustration tolerance; P: Participant number; G: Graduate; PG: Post-graduate; HS: Higher secondary; M: up to 10th standard; M: male; F: female; A: answer to question number.

Table 3: Answers suggestive of high risk of HRG participants' to questions of Section IV (VTRS) and Section V (LFT) based on various participants' characteristics.

Category of participants		VTRS (%)				LFT (%)				
		A 13	A 14	A 15	A 16	A 17	A 18	A 19	A 20	A 21
Age	≤40 years (n=40)	2.5	12.5	7.5	7.5	25	32.5	22.5	17.5	5
	>40 years (n=12)	0	0	0	0	0	8.3	8.3	0	0
Gender	Males (n=43)	2.3	11.6	7	7	16.3	27.9	20.9	16.3	4.7
	Females (n=9)	0	0	0	0	33.3	22.2	11.1	0	0
Education	Up to HS (n=22)	0	4.5	9.1	9.1	22.7	22.7	9.1	9.1	9.1
	Grad & PG (n=30)	3.3	13.3	3.3	3.3	16.7	30	26.7	16.7	0
Residence	Delhi (n=43)	2.3	7	4.7	4.7	18.6	30.2	23.3	14	4.7
	Outside Delhi (n=9)	0	22.2	11.1	11.1	22.2	11.1	0	11.1	0
Vehicle type	Non-motorized (n=5)	0	20	0	0	0	29	20	20	0
	Motorized (n=47)	2.1	8.5	6.4	6.4	21.3	27.7	19.1	12.8	4.3

A: answer suggestive of high risk to question number; VTRS: Tendency to violate traffic rule under stressful situation; LFT: low frustration tolerance; HS: higher secondary; Grad: graduate; PG: post-graduate.

4. Residence; Delhi or outside Delhi.

5. And Vehicle type: non-morotized (bicycle/rickshaw) or motorized (two and/or four wheelers).

Results

A total of 52 participants, who filled up the questionnaire, formed

the study group. There were 43 (83%) males and 9 (17%) females. Age ranged from 20 to 56 years with average age of 34 years. Educational qualifications of the participants were up to or less than 10th Standard (n = 13), higher secondary (n = 9), graduate (n = 19) and post-graduate (n = 11) levels. Participants used to drive 2-wheelers (n = 26), 4-wheelers (n = 13) or both 2 and 4-wheelers (n = 13). Table

1 shows participants' responses to the questions. Overall, majority of participants felt that people do not follow traffic rules and do not give way to non-motorized vehicles and pedestrians. Some of the participants had either seen or suffered from RTA themselves. Most of them were of the opinion that people should follow traffic rules. However a total of 9 (17 %) participants agreed that they will break the traffic rules under one (n = 6) or two (n = 3) out of four situations provided in the questionnaire (Table 2). Frustration tolerance was low based on answer/s of one (n = 9), two (n = 7), three (n = 4) or four (n = 2) out of five questions in a total of 22 (42%) of participants (Table 2). Table 3 shows high risk answers to the questions of section IV and section V of the questionnaire based on various participants' characteristics. On evaluation of answers of participants based on age of less than 40 and more than 40 years, VTRS and LFT were absent and much less respectively in participants more than 40 years of age. Similarly, VTRS was nil and LFT was less in female participants. Answers of participants educated up-to Higher Secondary (HS) level and those above HS level (graduate and post-graduate) and residents of Delhi and those who reside outside Delhi, were largely similar. However, VTRS and LFT was nil and less respectively in participants who used to ride non-motorized two wheelers (bicycle) than those who ride motorized two or four wheelers. Significance of these differences could not be ascertained due to small sample size.

Answers of HRG participants were tabulated together (Table 2 and 3) which revealed 1, 2, 3 and 4 high risk answers in 7, 8, 6 and 3 participants respectively amounting to a total of 24 (46%) participants. There were 9 (17.3%) participants willing to VTRS, whereas 22 (42.3%) participants had LFT. Two participants had tendency to VTRS without LFT, whereas 15 participants with LFT had no tendency to VTRS. Seven participants had both tendency to VTRS and LFT. There were three females in the HRG and all three had LFT alone without tendency to VTRS. HRG included drivers of 2-wheelers (n = 12), 3-wheelers (n = 6) and both 2 and 3 wheelers (n = 6). HRG participants' educational levels included Post-Graduate (PG) (n = 5), Graduate (n = 11), HS (n = 4) and up to 10th standard (n = 4).

Discussion

RTAs are a huge public health and development problem. Almost 1.2 million mortalities and injuring or disabling between 20 million and 50 million, about 90% of the current burden is borne by low-income and middle-income countries [4,10]. RTAs will get worse, a global public health crisis and by 2020, the third major killer as a 'disease of development. According to WHO report, 90% of the world's fatalities on the roads occur in low-income and middle-income countries, which have only 48% of the world's registered vehicles [10]. Although data on the costs of RTAs are sparse, particularly from low-income and middle-income countries, it is clear that the economic impact of these injuries on individuals, families, communities and nations is enormous, costing between 1% and 2% of the gross national product. The data is disturbing because RTAs are predictable and therefore preventable.

Paucity of research is shown, especially in the setting of the 'UN's Decade of Action for Road Traffic Injury Prevention 2010–2020', by the fact that a meta-summary of 8650 articles related to RTA preventive initiatives conducted in 2016, found only 3 articles from Asian countries, which fulfilled the eligibility criteria. Similarly, multiple journals have published calls for research, yet there has been

a relatively small increase in the literature [9-12]. The problem of road traffic crashes and injuries does not "belong" to any specific agency, either at national or international levels. There has usually been no leader to ensure that they coordinate their efforts and address the problem as a whole. Among various reasons for scarcity of research in this field, as per authors' understanding, one of the most important reasons is complete separation of trauma and head injury management discipline (clinicians who manage trauma patients) and behavior scientists/therapists. This is shown by the author profiles of all the available literature. Cohesive working by these two streams is the need of the hour, as unified recommendation by these two disciplines will definitely be more effective in conveying the urgency of the situation to the society and the administrators (state and central). There are some reports from different parts of the world including India, which have specifically evaluated various aspects of human behavior related to the causation of RTA [1,4-7,9,13]. Indirect approaches like legislations and traffic rule enforcements have been found to reduce RTAs up to 50%. Out of the twelve steps of accident investigation suggested by Sayer et al. [14] (Sayer IA, 1994) evaluation of Human factors is considered a part of it. In India, information of RTAs is primarily collected by the Police department and sufficient information is not available from the health sector and underreporting is a serious issue undermining the public health burden and impact of RTAs [15]. With just 1% of the world's vehicles, India manages to account for 10% of its road fatalities. "Road fatality rate" of India is as high as 14, which are 1.6 and 5 for United States and China respectively. Further, road fatality rate is showing a downward trend in China whereas India is showing a rise. If the current trends continue, the number of people killed and injured on the world's roads will rise by more than 60% by 2020 [16]. The World Health Organization (WHO) estimated that without the effective implementation of efficient counter-measures, an 80% increase in road traffic accidents should be expected in low- and middle-income countries during the period 2000 to 2020 [16,17]. Change in the mind set of riders and drivers and road users realizing their responsibilities alone can bring about a change. Current methods of raising awareness programs in India in the forms of legislative amendments, awareness programmes and law enforcements are showing insufficient results. Need for population specific behaviour studies can only guide us about identification of high risk group and would clarify whether any intervention is required. In our small study, 46% of participants showed feature/s for VTRS and/or LFT, which is a worrying sign and further highlights need of population specific studies and interventions suggested by behaviour scientists/therapists. Recently released "Traumatic Brain Injury: Multi Organizational Consensus recommendations for India" has shown current state of poor understanding of human behavior related and RTAs and road rage [18]. Earlier reports from India and other parts of the world have shown poor attitude rather than poor knowledge of the road users as the reason of RTA. Road rage too has been shown due to cultural habit of retaliation that occurs as a result of frustration and is independent of heavy traffic [13]. Questions of Section V of the questionnaire of our study were highlighting the aggressive behaviour of the participants and were observed in 42.3% of participants which was more than 17.3% participants who had tendency to VTRS based on answers of section IV of the questionnaire. It further confirms the findings by another Indian study which observed drift of aggression and violence into the mainstream Indian society. Similar findings in other reports show that road rage, relatively a newer entrant, has further complicated the existing problem.

External locus of control, sensation seeking behaviour, propensity to aggression and Type A behaviour pattern have been studied earlier and have been found positively correlated to RTA [6,17,19]. Road safety campaigns and trainings have been suggested to bring change in attitude for sustainable change in violation behaviour [6,19,20]. Educational programs may incorporate personality issues with the purpose of encouraging drivers to recognize the effects of certain traits and emotions that could put them and others at risk for serious RTAs. Similarly improving licensing program, to incorporate behaviour evaluation of the drivers and including study materials in the school curriculum may have early and long lasting effects. Having supportive attitude towards risky driving behaviors and not getting advice about risky driving from significant others increases the likelihood of developing risky driving behavior. Our findings of older participants, female gender and riders of non-motorized vehicle having less high risk behaviour are similar to the findings of earlier studies. Our study did not reveal much of a difference in the VTRS or LFT on the level of education as opposed to the earlier study which observed higher educated group showing higher violation behaviour towards traffic rules [4]. It may be due to small sample size or societal pattern. Further, in our study females showed no feature of VTRS, but 2 out of 9 female participants' revealed features suggestive of aggressive behavior, which needs further study to verify these findings.

Conclusion

The study of behavioural patterns of the population is an important step to understand the cause of progressive increase in road traffic accidents and road rage incidents in India, which is lacking at the moment. Such studies must be done jointly by trauma care teams and behavior scientists/therapists to seamlessly intervene, if needed, and put forth recommendations to the administrators (states and center) for greater effect and impact on implementation of those recommendations.

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