

IDENTIFICATION OF FACTORS INDULGING MOTORISTS BREAKING TRAFFIC RULES WITH REFERENCE TO DELHI NCR

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ABSTRACT

Everyday we are receiving the news about road accidents or observing different types erratic behaviour amongst the motorists in the roads of Delhi-NCR. Reports showed that, in India, number of deaths due to road accidents are much more than that due to terrorist activities. Further, the average vehicular speed on Delhi is gradually going down due to undisciplined driving activities. Being the capital city of the country, Delhi demands better traffic behaviour while it is showing one of the poorest scenario of the country even there is a strong Motor Vehicle rules prevalent. Though the problem is a serious one, profound researches on this issue could not be identified. Hence, as a first step, the researchers tried to identify prominent factors those are fostering the behaviour of the drivers / motorist towards manifestation of these types of undisciplined activities on the road. Altogether 255 respondents were interviewed through a structured questionnaire having 50 variables / statements. After factor reduction the researchers received 13 prominent factors which ultimately instigate the drivers / bikers / motorists to show different types of unruly behaviour on the roads of Delhi-NCR. This paper has immense value as it has paved the way for further research towards identification of dependant variables and to develop a strong model to arrest the problems of indiscipline on Delhi-NCR roads.

Keywords: Road Accident, Motor Vehicle Act, Vehicular Speed, Indiscipline on road, Factor Analysis.

INTRODUCTION

In today's world road and transport has become an integral part of every human being. Everybody is a road user in one shape or the other. The present transport system has minimized the distances but it has on the other hand increased the life risk. Every year road crashes result in loss of lakhs of lives and serious injuries to crores of people. In most of the cases crashes occurs either due to carelessness or due to lack of road safety awareness of the road user.

The number of vehicles and roads are increasing in a galloping way in India as one of most promising developing country since last two decades but at the same time the behaviour of the people on road has also changed profoundly towards breaking of traffic rules. The main activities that contribute to traffic rules breaking are over speeding, driving with drinking alcohol, driving without wearing helmet, using mobile phone during driving, riding with more pillion passenger, adventurism during driving etc. Road accidents have become a major public health concern in both developed and developing countries as they constitute a major cause of fatalities globally. Traffic accidents are an even greater issue as they are among the leading causes of death and injuries. Driving safety has become a priority issue in developing countries in view of the increasing motorisation levels. This calls for greater focus on driver attitudes and behaviour towards traffic safety. Driving safety is affected by various factors, which together determine the level of traffic safety or risk. Statistics shows that most road

accidents are attributed to 'human factor' most especially to traffic rule violations. The pedestrian injury event can result from a single factor or the complex interplay of multiple contributing factors both human and environmental. Increasing numbers of studies have highlighted the environmental and demographic connections with pedestrian injury. Human behaviour is another extremely important factor in pedestrian injury, however, less attention has been paid to this constituent of pedestrian-motor vehicle collisions.

LITERATURE REVIEW

In different parts of the globe road accidents are growing warningly, different researcher have done their study from different angle to get research conclusion. Some recent and important studies have been discussed below.

Jonghak (2018) has observed that road accidents are not only connected to driver's fault but the condition of the road and its surface conditions too. The study revealed that there are strong correlation between rain fall intensity and level of water on road surface. The study also identified that rain related factors are an important cause of traffic accidents due to the poor visibility and reduced friction resulting from slippery road conditions. In their study four latent variables represented the road i.e., traffic factors, environmental factors, human factors, and rain & water depth factors. In conclusion, compact cars, young drivers, female drivers, heavy rain, deep water and roads with a long drainage length are more likely to be associated

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with an increase in the level of accident severity features like a tangent, down slope, right-hand curve, and shorter curve length.

Kumar (2016) found that the worsening situation in road accidents and injuries varies according to age, gender and time. Most of the road accidents are identified in the age group from 30 – 59 years during extreme weather and working hours. On the other, Gaffar and Ahmed (2015) has concluded that road traffic accidents are increasing year by year just because of the excess speed or disobeying traffic signals on the road. Due to this approx. 19 deaths and 4 injuries occur on daily basis due to the road traffic accidents worldwide.

Annika and Jonas (2016) has identified that vehicle speed on roads is higher in daylight and under road lighting than in darkness and determined the combined effects of light conditions, speed limit and weather conditions on driving speed. The vehicle speed of passenger cars in different light conditions (daylight, twilight, darkness, artificial light) and different weather conditions (clear weather, rain, snow) was determined using traffic and weather data collected. Only data from the periods 10:00 A.M.–04:00 P.M. and 06:00 P.M.–10:00 P.M. were used to remove traffic during rush hour and at night. Analyses of vehicle speed and speed differences between daylight, twilight and darkness, with and without road lighting did not reveal any differences attribute to light conditions. However, vehicle speed decreased due to rain or snow and the decrease in speed was higher on roads without road lighting than on roads with lighting. These results suggest that the strong association between traffic accidents and darkness or low light conditions could be explained by drivers failing to adjust their speed due to the reduced visibility in dark conditions. Mentioning the work of Ludovic, Pauline and Emilie who has acknowledged that Traffic accidents were the leading cause of hospitalization in adolescence with the age 18 – 24 year old age group accounting for 23% of deaths by traffic accidents. Two categories of factors seem to be associated with traffic accidents: (1) factors specific to the traffic and (2) human factors which seem to be the most influential. Moreover, the establishment of a stronger relation to high speed driving increases traffic accident risks and also be intensified by sensation seeking. Other factors such as use (alcohol, drugs, and “binge drinking”) were also identified as risk factors. Furthermore, cell phone use while driving and attention deficit disorder with or without hyperactivity also seem to be important risk factors for car accidents. The family environment strongly influences a young person’s driving behaviour.

Rittger and Schmidt (2015) has identified the driver behaviour at traffic light signals intersections. Drivers should have behaviour to reduced fuel consumptions and emissions at traffic light intersections. Drivers switch off their cars when they are at red light so that they avoid strong accelerations and decelerations when approaching to green light as compared to changing red to green traffic light and the speed was reduced earlier when the light was red.

Kalra and Bansal (2014) identified the various methods for analysing driver behaviour using smartphone. To monitor driver behaviour various sensors are deployed inside the car, roadside, and inbuilt in smartphone. The driver behaviour has recorded and given feedback of recorded driver behaviour feedback what they have intentionally or unintentionally done like harsh riding, sudden turns, sudden brakes.

Brown (2014) has identified that there was a gender difference in crash driving among young drivers. Young drivers were more in crashes and there was a difference between young adults. Young male have higher rates of deaths than young females. The gender difference drivers aged between 17 – 25 years in crashes. 59% of the males and 41% of the females were young drivers.

Singh and Kumaran (2014) has identified that traffic fatalities constituted with 41% of all unnatural deaths. The people in the age group of 21 – 30 years were most affected in road traffic fatalities. The people were from rural areas. The pedestrians and two wheelers has got majority fatalities due to collision between two wheeler and light motor vehicles. The maximum number of accidents occurred between the time 4 – 8 pm. Majority of the people were of unskilled workers and agricultural workers found in the road traffic fatalities.

Millicent and Richard (2013) has observed that there were age and gender differences in drivers attitudes towards traffic violations. Age and gender have significant influence on attitude towards traffic violations by a larger margin. Driver attitude towards traffic violations with men has been more motivated by the females. Neither significant nor great difference were found.

Humera and Chakrabarty (2013) has found that the wheeler riding patterns among college youth were more aggressive and riding behaviour and experience provoke anger while riding among college going youth. There were top 5 reasons or sources which reported as irritation in the youth riders i.e 1) being caught up in heavy traffic, 2) bad road conditions, 3) repeated honking, 4) cutting into my lanes, 5) polices mismanages traffic. Men get irritated faster in heavy traffic than the women. 15 – 20% of the participants reported anger expressions while riding such as gestural expressions, angry face etc. The items which were most endorsed by men and women were the tendency for violations traffic rules if there were no traffic police. They also do over speeding and overtaking if they are not in hurry and compete with each other.

Elvik (2013) concluded that the road accidents was associated with the use of drugs. The drugs was associated were named as amphetamines, analgesics, anti-depressive, cannabis, cocaine etc. The usage of drugs increases road accident risks. There were the dose – response relationship between the dose of drugs taken and effects on accident risks. The drugs tends to have a larger effects on the risks of fatal and serious injuries by the accidents.

Nasar and Troyer (2013) acknowledged that pedestrians were distracted by the unattention and unsafe behaviour talking or texting on their mobile phones. Mobile phones has increased pedestrians injuries for drivers. Pedestrians injuries were higher for males under the age category of 31 years old due to the usage of mobile phones while walking or crossing zebra and they cause injuries or got struck with a car and may cause a death.

Francisco, Cristina and Constanza (2013) recognized that drivers speed accidents relations on the road. They said that approx. one third of the drivers always speed up on the road and they were aware of the fact that they are breaking the traffic rules. Their speeding up behaviour is intentional and drivers said that they do so because of the conditions of road or speed limits are too slow that they are not comfortable to drive on the mentioned speed and they are not able to drive on the road and may have the risk of having road accidents. Where as

Tefft (2012) has identified the relationship between impact of speed and risk to struck pedestrians above the age of 15+ struck by cars in the year 1994 – 1998. For example the average risk of death for a 70-year-old pedestrian struck at any given speed was similar to the average risk of death for a 30-year-old pedestrian struck at a speed 11.8 mph faster.

Bahar, Turker and Timo (2010) has identified the stress reactions and risky driving among Professional and non-professional drivers. They investigated stress reactions, speeding, number of penalties and accident involvement among different driver groups (taxi drivers, minibus drivers, heavy vehicle drivers, and non-professional drivers). Five dimensions of the dsi were measured aggression, dislike of driving, hazard monitoring, fatigue proneness, and thrill-seeking. Dislike of driving and thrill-seeking dimensions of the DSI were related to speeding on in-city roads.

Watson et al. (2007) conducted a research project to study the psychological and social factors that influence the motorcycle riders intension and behaviour in Australia. They conducted a series of studies and identified six different types of behaviours those commonly influence the safety (or riskiness) of motorcycle riding. The identified behaviours are (i) necessity of being able to handle the motorcycle proficiently and skillfully, (ii) the need for riders to maintain a high level of concentration whilst riding and to stay aware of the changing road environment, (iii) obeying the road rules versus breaking the road rules that is essential to their safety, (iv) riding whilst impaired, (v) pushing the limits of their ability on a motorcycle and (vi) extreme riding. Their study revealed that these six behaviours do not have significant correlations . But a significant associations were found between traffic offence involvement and five of these six examined behaviours .

Freddie and Joseph (1998) studied the social norms of individuals driver. The social norms include injunctive norms, descriptive and perceived behaviour. The descriptive norms were described as “ if everyone is doing it then it must be sensible thing to do same “ .

OBJECTIVE OF THE STUDY

The objectives of conducting this study are:

- (a) To understand the behaviour of the motorists or drivers on road.
- (b) To identify factors indulging motorists or drivers to break traffic rules.

RESEARCH METHODOLOGY

In this descriptive research, primary data has been used. To collect Primary data interview method was adopted and the same has been collected through a questionnaire developed. To develop the questionnaire, a pilot study has been conducted with 30 drivers who have broken traffic rules and punished by the traffic police. From their open ended interview altogether 86 statements were prepared. To authenticate its content validity, the same statements were verified by 5 experts like Traffic Police Officers, Trauma Centre Medical Officer, Psychologist and Insurance Claim Settlement Officer. They have nullified some 22 statements and keep 54 statements as valid. Further to substantiate the construct validity, these 54 statements were further interviewed to those pilot study subjects after a gap of 4 months. This test-retest method cancelled 4 more statements as their construct value is too little to consider. Finally the questionnaire was developed with 50 statements. All the statements are positive in meaning and contain five options to answer. All these options are in Likert format. The data has been collected from 255 drivers, having diversified demographic profile, residing in Delhi/NCR region. The sample has been chosen through convenience sampling method. Reliability of the questionnaire has been tested and its Cronbach’s alpha has been calculated as 0.895.

Table 1: Reliability Statistics of Traffic Rule Breaking Behaviour Statements.

Cronbach's Alpha	No. of Items
0.895	50

RESULTS AND DISCUSSIONS

The descriptive statistics as depicted in table 2 comprises of the frequency and percentages of profiles of the respondents. This Table 2 illustrates the demographic profiles of respondents according to different variables like driving license owned, gender, academic qualification, vehicle ownership type, marital status, profession and age respectively.

Table 2: Demographic Profile of Respondents

Demographic Profile	In figures	In Percentage
DRIVING LICENSE OWNED		
YES	235	92.2
NO	20	7.8
GENDER		
MALE	153	60.0
FEMALE	102	40.0
ACADEMIC QUALIFICATIONS		
BELOW 10	2	0.8
10+2	28	11.0
GRADUATE	122	47.8
POST GRADUATE	103	40.4
VEHICLE OWNERSHIP TYPE		
CAR	143	56.1
BIKE/SCOOTY	112	43.9
MARITAL STATUS		
MARRIED	64	25.1
UNMARRIED	191	74.9
PROFESSION		
STUDENT	162	63.5
BUSINESSMEN	26	10.2
GOVERNMENT SERVICES	16	6.3
PRIVATE SERVICES	37	14.5
HOUSEWIFE	6	2.4
SELF-SALARIED	8	3.1
AGE		
18-25	193	75.8
26-35	39	15.4
36-45	13	5.2
46-55	6	2.4
56 above	3	1.2

Factor Analysis technique has been used to identify factors influencing the behaviour of the drivers towards breaking traffic rules as it attempts to identify underlying variables, or factors, that may explain the pattern of correlations within a set of observed variables. Values of Bartlett's test of sphericity and Kaiser-Meyer-Olkin measure of sampling adequacy were tested to determine the factorability of the matrix as a whole.

Table 3 : KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.802
Bartlett's Test of Sphericity	Approx. Chi-Square	3860.805
	Df	1225
	Sig.	0.000

The results value of Bartlett's test of sphericity is significant ($p < 0.001$, $p = 0.000$). The Kaiser-Meyer-Olkin Measure of Sampling Adequacy is a statistic that indicates the proportion of variance in variables that might be caused by underlying factors. High values (close to 1.0) generally indicate that a factor analysis may be useful with the data. If the value is less than 0.50, the results of the factor analysis probably won't be very useful. Here KMO value is 0.802 which lies between 0.8 and 1 indicating the sampling is adequate. The theory says that if the Bartlett's test of sphericity is significant and if the Kaiser-Meyer-Olkin measure is greater than 0.6, then the data is sufficiently adequate for applying factor analysis. Thus, based

on the results, it is appropriate to proceed with Factor Analysis to examine factors affecting the behaviour of the drivers towards breaking traffic rules.

Initial communalities are for correlation analyses, the proportion of variance accounted for each variable by the rest of the variables. Communalities indicate the amount of variance in each variable that is accounted for. Initial communalities are estimates of the variance in each variable accounted for all variables or factors. For principle component extraction, this is always equal to 1.000 for correlation analysis. In table no 4 communalities are all high. The communalities for this solution are acceptable because the value of this test is 1.000.

Table 4 : Showing communalities

Factors	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13
Initial	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Table 5: Total Variance Explained

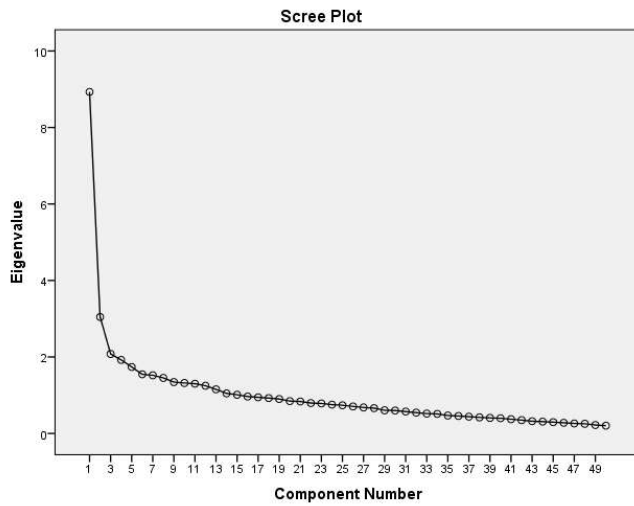
Component	Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
1	3.512	7.025	7.025
2	3.110	6.220	13.245
3	2.734	5.468	18.713
4	2.610	5.220	23.933
5	2.603	5.206	29.139
6	2.443	4.886	34.025
7	1.938	3.876	37.901
8	1.753	3.506	41.407
9	1.743	3.487	44.893
10	1.612	3.223	48.117
11	1.553	3.106	51.223
12	1.513	3.026	54.250
13	1.474	2.947	57.197

Extraction Method: Principal Component Analysis.

Table 5 displays the total variance explained at eleventh stages for factors inflicting unruly behaviour of the drivers. Thirteen factors were extracted because their Eigen values were greater than "1". Figure 1 is Showing scree plot of 50 variables. The scree plot confirms the choice of thirteen components are there which is above 1 in eigenvalue as shown in figure of scree

plot. The scree plot is a graph of the eigenvalues against all the factors. The graph is useful for determining how many factors to retain. The point of interest is where the curve starts to flatten. These thirteen factors, when extracted, were able to explain 57.197 percent of the variance.

Figure 1 : Showing Scree Plot of 50 variables



The Table 5 shows the actual factors that were extracted. For analysis purpose, here the researchers focussed on Rotation Sums of Squared Loadings. In Rotation Sums of Squared Loadings, the “% of variance” column explains how much of the total variability (in all of the variables together) can be accounted for by each of these summary scales or factors. All the factors extracted therefore, were able to explain 57.19% of the total variance.

Table 6: Rotated Component Matrix

	Component												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Q1				0.67									
Q2	0.64												
Q3	0.61												
Q4	0.58												
Q5				0.40									
Q6												0.78	
Q7	0.57												
Q8	0.57												
Q9													0.75
Q10					0.49								
Q11	0.44												
Q12											0.45		
Q13				0.33									
Q14			0.48										
Q15						0.59							
Q16									0.54				
Q17			0.76										
Q18						0.52							
Q19					0.68								
Q20			0.48										
Q21		0.52											
Q22				0.49									
Q23		0.38											
Q24						0.46							
Q25										0.71			
Q26									0.51				

Q27				0.58									
Q28								0.74					
Q29						0.36							
Q30										0.49			
Q31						0.64							
Q32				0.43									
Q33			0.41										
Q34					0.61								
Q35							0.72						
Q36		0.39											
Q37									0.69				
Q38		0.59											
Q39												0.41	
Q40						0.36							
Q41		0.50											
Q42							0.46						
Q43											-0.74		
Q44							0.45						
Q45			0.55										
Q46		0.63											
Q47		0.38											
Q48					0.52								
Q49		0.66											
Q50								0.36					

Extraction Method: Principal Component Analysis.*Rotation Method:* Varimax with Kaiser Normalization. Rotation converged in 21 iterations.

Table 6 shows the rotated factor matrix for the questionnaire. After performing Varimax Rotation Method with Kaiser Normalization, Factor 1 comprised of six items with factor loadings ranging from 0.44 to 0.64. Factor 2 comprised of eight items with factor loadings ranging from 0.38 to 0.66. Factor 3 comprised of five items with factor loadings ranging from 0.48 to 0.55. Factor 4 comprised of six items with factor loadings ranging from 0.40 to 0.67. Factor 5 comprised of four items with factor loading 0.49 to 0.68. Factor 6 has six items ranging from 0.36 to 0.64. Factor 7 has three items ranging from 0.45 to 0.72. Factor 8 has two items with factor loading from 0.36 to 0.74. Factor 9 has three items ranging from 0.51 to 0.69.

Factor 10 has two items ranging from 0.49 to 0.71. Factor 11 has two items ranging from -0.74 to 0.54. Factor 12 has two items ranging from 0.41 to 0.78 and finally Factor 13 has only one item of 0.75. Thirteen factors were successfully constructed using factor analysis and assigned as the factors influencing the behaviour of the drivers on road to break traffic rules.

Table 7 shows the 13 newly developed factors and percentage of variance explained for each of the factors. The first factor shows the highest percentage of variance explained when it was extracted. These factors has not been assigned with any suitable name and they are earmarked by numbers.

Table 7: Factors influencing Driver's Behaviour towards breaking of Traffic Rules

Factor	% of Variance
1	7.025
2	6.220
3	5.468
4	5.220
5	5.206
6	4.886
7	3.876
8	3.506
9	3.487
10	3.223
11	3.106
12	3.026
13	2.947

FINDINGS

To make the theoretical contribution of this research easier to follow, the findings has been presented according to the research objectives outlined in the introduction.

- (a) There are thirteen factors which are primarily influencing the behaviour of the drivers to break traffic rules and show undisciplined behaviour at roads. The factors are named as Factor-1 to Factor-13.
- (b) These factors are generated by some hidden issues those ultimately surfaced as an outcome of road indiscipline.
- (c) One of the most important factors is 'Adrenaline Effect' which is being charged momentarily inside the driver by any stimuli.
- (d) Another important factor is 'Gene Factor' which the driver carries from a long time.
- (e) The third important factor is 'Power factor' which is connected to issues related to showcase the economic power or social or political influence.
- (f) The fourth important factor that has been identified is 'Vexed Factor' which is related to create pleasure in the mind of a person by creating disturbance to others.
- (g) The questionnaires were filled by 255 respondents who are from different region of Delhi-NCR. The survey shows that majority of the respondents have driving license.
- (h) The study indicates the responses drawn from majority of the drivers falling in the age group of 18-25 years. The research shows that majority of the respondents surveyed were from students.

- (i) The research shows that majority of the respondents surveyed having academic qualification 'Graduate'.

MANAGERIAL IMPLICATIONS

The literature review shows that the road unrests are increasing day by day and there are some obvious reason behind it. This research identified some underlying factors which ultimately influencing the drivers to break traffic rules and thereby create road accidents, either fatal or minor. Some of this factor even lead to fatal injury to the pedestrians for the activities of the undisciplined drivers. But no such activity or governmental initiatives have been observed so far to identify the root causes of this problem. This study will be a path finder to solve those burning issues of the society.

SCOPE FOR FUTURE RESEARCH

This study has been conducted on a very small portion of the population with limited resources. Due to time and resource constraints some research methodology steps have been skipped. But still this study can be considered to be pioneer for further research on social study. As the objective was to find out factors, the study could not explore the variables identification or their correlation. In future, this study can be extended towards those directions.

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