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Driver Behavior as Road Safety Indicator– A Case Study of Gorakhpur, Uttar Pradesh, India

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ABSTRACT: Driving can be considered as a goal-directed behavior, i.e. going from one place to another. Reaching the destination in time and maintaining safety are the two main aspects or goals while driving, when these goals get blocked, emotions may occur, which in turn leads to behavioral change. Any 'interruption' of goal-directed behavior is likely to release a negative effect and any 'Promotion' of goal-directed behavior is more likely to induce a positive effect. In this study, various behavioral driving of road users in Gorakhpur district (U.P.), India is studied with the help of instrument Drivers behavior questionnaire and their relationship with road accidents is also done. A total of 391 drivers were randomly assigned to complete the survey and the finding shows that 12.4 percent of drivers are likely to make errors and 8.9 percent have critical driving behavior. Both groups of driver's behaviors are very dangerous to other drivers and this behavior is seen to be significantly related to gender. Even though the study found that the percentages of drivers who commit aggressive as well as ordinary violations are small, but they should consider road safety because they travel on roads daily to do their work and other social responsibilities.

Keywords: Road users, Drivers behavior, Road safety, Road safety in Gorakhpur, Traffic Safety, Road safety in India

I. INTRODUCTION

In present study, Gorakhpur district which is situated in Uttar Pradesh (India) is selected as study area. With a population of more than 4.4 million. Gorakhpur district spreads over an area of 3,483.8 square kilometers (1,345.1 sq. mi). It is surrounded by Maharajganj district towards north, Deoria and Kushinagar districts in the east, Mau, Ambedkar Nagar and Azamgarh districts to the south, and Sant Kabir Nagar district towards west [32]. Gorakhpur district is part of Gorakhpur division. The existing Road network in Gorakhpur consists of arterial roads, sub arterial roads, local streets, State highways and National highways. However, In Gorakhpur district, a large number of roads are narrow and not appropriate with respect to surface conditions and geometrics. Road markings on the roads are not done properly. Many intersections are not designed properly and are also closely spaced. Mixed traffic can be seen everywhere like vehicles of different shapes, sizes traveling together. The negligence of lane concept and flow of various types of vehicles on a single lane is quite common phenomena.

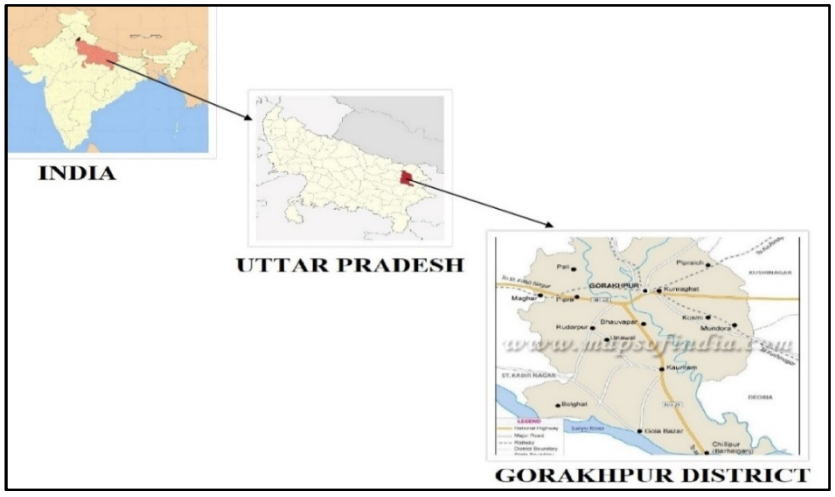

Fig. 1. Map of Gorakhpur district (Source: www.mapsofindia.com) [30].

The transport system of Gorakhpur district mainly consists of Buses, minibuses, cars, motorcycles, taxis, hand-pulled rickshaws, bicycles and auto-rickshaws (three-wheeled motorized vehicles). The traffic operation in Gorakhpur is managed by the Gorakhpur Traffic Police and the Uttar Pradesh Police. Both agencies have specific areas of operation. As per data provided by District crime record bureau (Gorakhpur), During the period 2013-2017, the total number of road accidents in Gorakhpur increased by 23 per cent from 738 to 962.By contrast, the number of deaths due to road accidents increased by 21 per cent from 321 to 409 during the period 2013 to 2017.On the other hand, the number of minor injuries due to accidents had increased by around 13.54 per cent from 568 to 657 during 2013-2017.

For current study of Drivers' behavior, four points of Gorakhpur district was selected to meet drivers and provide them questionnaires for response. Those points are Bus Station Crossing, Railway Station crossing, Transport Nagar Area and Sahajanwa Bypass Road. Selection of these points are only due to presence of drivers of each type of vehicles.

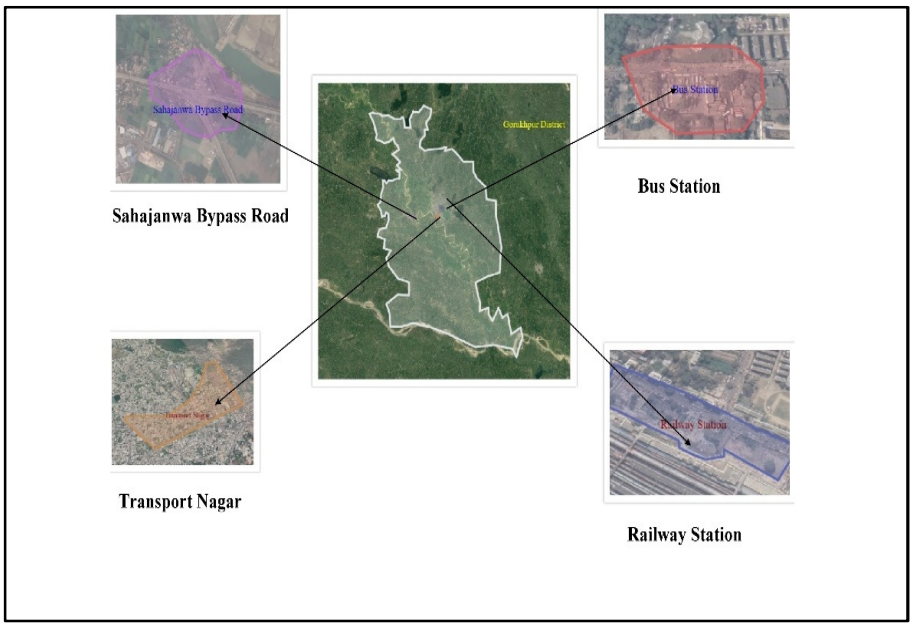

Fig. 2. Selected locations for this area (Image Source: Google Maps) [31].

Road traffic accidents are one of the most important public health and injury prevention problems in all over world. The problem is even more acute because the victims are healthy before they met accidents. According to a report published by World Health Organization (WHO), more than 1 million people are killed on the world's roads every year. Another report published by the WHO in 2004 estimated that around 1.2 million people were killed, and 50 million people injured in traffic collisions on the roads around the world each year [29]. According to ministry of road transport & highways transport research wing (New Delhi), States and union territories reported 4,64,910 as total no. of road accidents and 1,47,913 reported as killed while 4,70,975 reported as injured [28]. There are many contributing factors behind this situation. If talk about vehicle categories involved in road accidents in India, two-wheelers accounted for highest share (33.9%) in total accidents and fatalities (29.8%) in 2017. Light vehicles including cars, jeeps and taxis as a category comes a distant second with a share of 24.5 percent in total accidents and 21.1 percent in total fatalities. Although, Govt. of India is working very hard to reducing road accidents by new rules and regulations on use of helmets, seat belt, alcohol limit, speed limit and various other factors. According to previous studies, Roads' condition and driver behavior are spotted as important factors for road accidents in India. Factors due to drivers such as incompetent drivers, careless, Unfocused, reckless and aggressive behavior while on the road are considered as the dominant factors.

Reason *et al.* (1990), who first investigated driving behavior suggest that errors and violations made by drivers are the main determinants for road accidents [23]. After this, several Drivers behavior questionnaires (DBQ) models have been developed with some modifications like lapses, aggressive violations made by drivers etc. Previous DBQ investigations were mainly focused on drivers' errors, lapses etc. with road accidents. Differ from these studies, this paper aims at clustering the driver's opinion instead of clustering the variables (errors, lapses, violations). List of previous studies are given in Table 1.

Table 1: List of Previous Research.

S. No.	Researcher	Contribution
1.	Gilboa-Schechtman *et al.,* (1999) [1]	They found that when age is considered drivers seem to be more law abiding and take lesser risks as they grow older, it is also seen that drivers over 55 years seem to drive more carefully than younger drivers do [1].
2.	Norris *et al.,* (2000) [2]	They found that younger age is important predictors for future motor vehicle accidents (MVAS) because younger adults having age between 19 to 39 years are twice as likely to have an accident in comparison to other older adults having age between 56 to 88 years [2].
3.	Elander *et al.*, (1993) [3]	Elander *et al.*, (1993) found that younger drivers are tending to have an increased crash involvement. The recent studies consistently pointed out that younger drivers are at a greater risk of being involved in a traffic crash [3].
4.	Beck *et al.*, (2006) [16]	Found that younger drivers having age of 18 – 19 years old have highest violation and crash rates in comparison to drivers of older age [16].
5.	Vassallo *et al.,* (2010) [17]	Reported that majority of young people are identified as in moderate and high-risk driving cluster at an age of 19 – 20 years which is reduced by 23–24 years [17].
6.	Stradling, (2000) [4]	Stradling, (2000) identified that drivers who are young and having very less driving experience are a high-risk group of drivers [4].
7.	Mccartt *et al.,* (1999) [5]	Mccartt *et al.,* (1999) reported that driving violations are increasing with increase in driving experience while the frequency of drowsy driving is decreasing with increase in driving experience (When controlling for age). On other hand, when authors controlled for driving experience, driving violations found in decreasing nature as age of driver increased while drowsy driving found increasing as age of driver increased [5].
8.	Waller *et al.* (2001) [6]	Their research findings reveal that crash odds are decreased 5 percent with increase in each additional year which was almost same as research findings of previous researchers who reported a 6 percent risk reduction [6].
9.	Dobson *et al.,* (1999) [7]	Researchers found that women having literacy education and have a mid-age group of 45-50 years showed a significant higher accident risk. On other hand, there are no effect of education on younger driver's group aged between 18-23 years [7].
10.	Shinar *et al.* (2001).	Drives with higher education was more likely to report that they speed more than the other drivers who were with lower levels of education [8].
11.	Hatfield and Job (2006) [9]	Hatfield and Job (2006) revealed that, the more the level of education of the respondents the higher the likelihood to speed, the more the chances to give greater estimate of the number of kmph over a 60 kmph speed limit the higher the chance of crashing [9].
12.	Yilmaz and Celik (2006) [10]	Yilmaz and Celik (2006) examined the effect of education, age and experience on driving behavior and found that men are eager to bend basic traffic rules than women, while 19-29 age groups take the highest average value on violation to traffic rules the lowest average value is for the 61 and older age group, and for education level and experience risk taking was not found to be significant [10].
13.	Aarts and Van Schagen (2006) [11]	Speed is at the core of the road safety problem. Very strong relationships have been established between speed and both crash risk and crash severity [11].
14.	Elliott *et al.* (2004) [12]	Excessive driving speed for the existing road conditions is considered as one of the most important contributors to road crashes. Regardless of the driver's age and level of skill [12].
15.	McKenna & Horswill (2006) [13]	McKenna & Horswill (2006) Suggested that involvement in speeding behavior may also be due to a low probability of negative outcome [13].
16.	Fleiter & Watson [14]	Found that large number of motorcyclists do not consider speeding as a dangerous thing. On other hand, majority of

		drivers admitting to exceeding the speed limit at least occasionally by 10kmph or more [14].
17.	Ellison & Greaves (2010) [18]	Ellison & Greaves (2010) showed that overall twenty percent of the moving distance travelled was above the posted speed limit, with a small but significant number of drives regularly travelling more than 10 kmph above the speed limit, Exploratory analysis showed that speeding is more than females but there are only marginal differences as far age is considered [18].
18.	Dula *et al.,* (2003) [24]	They created Dula dangerous driving index (DDDI) to measure drivers' self-reported behavior to drive dangerously. 119 young college students were selected to examine various driving related behaviors. They found that male respondents reported more aggressive than female respondents [24].
19.	Farooq & Juhasz (2018) [25]	In their study, they developed an initial set of measures to analyze young drivers behavior related to road safety issues in various countries. They found that Drivers in Budapest are more disciplined than drivers of Islamabad city [25].
20.	Zhang *et al.,* (2019) [26]	Their study was aimed to investigate how driving anger and abnormal driving behavior are associated to crash risk with the help of on mediated model. Their findings are quite useful in reducing road traffic accidents in China. [26].
21.	Roslin *et al.,* (2019) [27]	Their study reveals factors responsible for aggressive driving behavior among various Malaysian Drivers. They used Driving anger expression inventory (DAX) to analyze factors corresponding to their anger while driving on the roads [27].

II. DESIGN OF RESEARCH

A. Area of Study

Gorakhpur district (U.P.), India was selected for study and data collection. Gorakhpur district lies between latitude 26°46'N and longitude 83°2'E. The district spreads over an area of 3,483.8 square kilometers. Due to large number of drivers in district, all respondents could not interview due to practical difficulties. So, we followed Minimum sample size method for obtaining minimum sample size.

Minimum sample size (n) = $\sum^2 * p * (1-p) / m^2$

Where:
n = required sample size (minimum size)
Σ = Confidence level at 95% (standard value of 1.96)
p = Estimated fractional population of subgroup
m = Margin of error at 5% (standard value of 0.05)

As per the formula, the required sample size is 383 drivers. So, total 383 drivers were selected from all 7 tehsils named as Campierganj, Sadar, Sahjanwa, Khajni, Chauri–Chaura, Bansgaon and Gola in Gorakhpur district according to their population proportion. Total 450 questionnaires are distributed to drivers. Out of 450 questionnaires only 391 respondents returned completely filled questionnaires. Hence the sample size is 391.

B. Method of Sampling

For selection of drivers, Convenience sampling technique is used. 391 completely filled up questionnaire are collected from drivers. Received questionnaires is checked and data is extracted for further study.

C. Pilot Study

Every Researcher strongly recommend pilot testing of the instrument they used. Total 30 drivers were selected for pilot study. For Validation, appropriate reliability and validity tests of the measurement were taken. The questionnaire for the drivers in Gorakhpur district was pre tested with 30 samples. After the pre testing, necessary modifications were made in the questionnaire.

D. Research Instrument

The questionnaire includes a set of 104 questions printed in a definite set of forms. The questionnaire was framed including demographic profile of drivers, errors, violations, Dula dangerous driving scale, self-reported speeding scale, propensity for aggression, traffic awareness, alcohol consumption of individual.

E. Analysis Method

The main objective of this study is to cluster each driver to their respective group of driving behavior by using cluster analysis. Each driver was asked to answer a set of questions having a Likert scale for each question. For example, in "Propensity for Aggression Scale" section, drivers were asked to answer on a 7-point Likert scale- Never to always.

F. Research Findings

A total of 391 questionnaires were selected and analyzed and Table 2 shows demographic characteristics of drivers. It is clearly seen from above table that majority (81.58%) respondents were male and 82.86% respondents were married. Only 30.18% respondents having graduate degree while 42.46% drivers were in an age group of 30–39 years. Most (47.57%) drivers have driving experience of 5 to 10 years and 44.24% drivers drive cars.

III. ANALYSIS OF DRIVING BEHAVIOR

Likert five-scale is used for each question included in driver behavior questionnaire. DBQ is divided on the basis of 5 behavior parameters. Each parameter has a particular set of questions. Since Likert five-scale is used for each question asked, thus the appropriate

central measurement for ordinal data is to use percentage. Distribution of driver's' responses is given below in Table 3.

Table 2: Distribution of Respondents' Characteristics.

S. No.	Characteristics	Frequency	Percentage
1	**Gender:**		
	Male	319	81.58
	Female	72	18.42
2	**Marital Status:**		
	Married	324	82.86
	Unmarried	67	17.14
3	**Level of Education:**		
	Illiterate	31	7.93
	Primary	81	20.71
	High School	98	25.06
	Intermediate	63	16.11
	University	118	30.18
4	**Age:**		
	Less than 20	38	9.72
	20 to 29	57	14.56
	30 to 39	166	42.46
	40 to 49	98	25.06
	Greater than 50	32	8.18
5	**Driving Experience:**		
	Less than 2 years	53	13.55
	2 to 5 years	73	18.67
	5 to 10 years	186	47.57
	More than 10 years	79	20.20
6.	**Vehicle Used:**		
	Car	173	44.24
	Bus	59	15.08
	Mini Bus	26	6.65
	Truck	96	24.56
	Auto	37	9.46

Table 3: Distribution of Driver's responses.

Parameters	1	2	3	4	5	Mode
Errors of drivers						
Failed to notice a pedestrian crossing when turning into a side-street from a main road.	32.9	31.6	21.8	9.7	4.0	1
Misjudged the road surface, through which your braking path is longer than you expected.	37.1	28.0	16.6	9.8	8.5	1
Almost go off the road because you ride too fast when turning a corner.	21.6	19.9	32.4	18.4	7.7	2
Underestimate the speed of an oncoming vehicle when overtaking.	22.8	42.5	17.3	11.4	6.0	1
Brake too quickly on a slippery road and/or steer the wrong way into a skid.	18.1	29.7	42.6	8.0	1.6	1
Driving behavior (Critical)						
I lose track of where I am going	18.6	14.2	39.7	20.7	7.1	1
I yell at the driver/drivers who make me nervous	40.9	36.4	14.5	5.7	2.5	1
I have trouble staying in the correct lane. I drift into other lanes	36.4	28.9	17.6	11.1	6.0	1

I forget to make appropriate adjustments in speed	32.0	29.1	25.9	9.1	3.9	1
I maintain a large distance between myself and the driver in front of me	36.8	44.2	14.6	2.4	2	1
I make gestures at the driver/drivers who made me nervous	64.2	22.8	11.1	1.3	0.6	1
I try to put distance between myself and other cars	28.6	31.5	23.2	12.2	4.5	1
I honk my horn at the driver who made me nervous	62.1	29.7	7.3	0.9	0.0	1
I try to find ways to let other drivers know that they are making me nervous	51.6	31.8	10.1	4.7	1.8	1
I have difficulty merging into traffic	30.1	26.7	31.4	7.8	4	1
Propensity for aggression						
Felt frustrated by other road users	64.1	23.2	8.4	3.2	1.1	1
Felt angry and aggressive towards another road user	59.5	26.3	8.6	3.6	2.0	1
Indicated your hostility towards another road user by whatever means you could	74.0	16.4	5.9	2.6	1.1	1
Gave chase when angered by another rider or road user	48.4	39.3	8.7	2.4	1.2	1
Physically attacked another vehicle or rider or road user	22.3	35.6	16.9	12.4	12.8	1
Dula Dangerous driving index						
I lose my temper while driving	41.9	32.7	12.8	8.7	3.9	1
I always consider the actions of other drivers to be inappropriate or stupid	37.6	43.2	13.9	4.8	0.5	1
I flash my headlamps when I get annoyed by other driver	24.2	31.7	25.9	10.3	7.9	1
I make rude gestures e.g. giving fingers, yelling curse words toward drivers who annoy me	12.6	11.8	62.4	9.4	3.8	1
I verbally insult drivers who annoy me	12.6	11.8	62.4	9.4	3.8	1
I illegally pass a car/truck that is going too slowly	42.7	35.2	11.1	9.2	1.8	1
When I get stuck in a traffic jam, I get very irritated	32.5	58.4	6.5	1.6	1.0	1
Passengers in my vehicle tell me to calm down	38.9	35.4	18.6	5.1	2.0	1
I get irritated when a vehicle in front of me slows down for no reason	46.4	30.2	17.4	5.2	0.8	1
I will drive in the shoulder lane or median to get around a traffic jam	33.9	50.3	10.4	4.2	1.2	1
I will drive when I am in drunken condition	29.4	25.1	38.4	5.3	1.8	1
I feel that most traffic rules could be considered as suggestions or advice	29.7	26.3	36.4	5.4	2.2	1

Where, 1: Never, 2: Occasionally, 3: Quite often, 4: Frequently, 5: Nearly every time

IV. RELIABILITY / CONSISTENCY TEST

Reliability test is performed based on Cronbach's coefficient Alpha (α). Results for Cronbach Alpha reliability test for four driver behavior are listed below in table 4. In all four driver behavior domains, each driving behavior scale seemed to be the most internally consistent based on Fraenkel dan Wallen (1996) [19] opinion by setting the value of α between 0.70 – 0.99 whereas the propensity for aggression had the lowest alpha values (α = 0.708). The Cronbach multiplier value obtained is set at the same level as per other literature.

Table 4: Alpha reliability coefficients.

Driver Behavior	Cronbach's coefficient Alpha (α)
Errors of drivers (5 items)	0.715
Driving behavior (Critical) (10 items)	0.750
Propensity for aggression (5 items)	0.708
Dula Dangerous driving index (12 items)	0.738

V. DATA ANALYSIS

Data analysis is done with the help of cluster analysis method. Cluster analysis is applied with the aim to group individuals and procedure empirically forms clusters or groups that have a high similarity among entities. Due to data's ordinal form, a hierarchical clustering method is the most appropriate among others when data size is small and able to produce cluster solution easily by maximizing the number of clusters. Average linkage measurement method was chosen to compare the first group to the second group in forming groups" identities and it utilizes all information of the differences in calculations to combine each cluster. The number of clusters formed was determined to be only two groups. The result of cluster analysis is shown

in Table 5 as follows, based on four domain of driving behavior.

In this study, we found that percentage of first group (Group A) is higher than compared to the second group (Group B) for all four research domains. From 391 drivers, 87.6 percent is clustered in the group A and the rest is in the group B. The meaning for group A and group B can be observed from the score value of each driver behaviors domain. The average score analysis for above four groups is shown in table 5. It is found that the score value for group B is higher than the group A for the entire driver behaviors domain. This means that the tendency for offences for the entire driver behaviors domain is high for the second group.

The next question is whether the variation based on the average score is significantly vary can be test by using the t-statistic test. The result indicated that the score differentiation between the two groups is significant at one percent significant level for the entire domain. Therefore, it can be concluded that the group B has the higher tendency to commit offences compared to group A (group A= low tendency, group B = high tendency). This is quite alarming since 12.4 percent of respondents are likely to commit various errors of drivers, followed by 15.2 percent of respondents who are likely to be careless in Dula dangerous driving index. Two driving behaviors, namely Driving behavior (Critical) and Propensity for aggression recorded a small percentage. Results of sample tests is given below in table 6.

Table 5: Cluster analysis result.

S.No.	Driving Behavior (n = 391)	Group A (%)	Group B (%)
1	Errors of drivers	87.6	12.4
2	Driving behavior (Critical)	91.1	8.9
3	Propensity for aggression	88.6	11.4
4	Dula Dangerous driving index	84.8	15.2

Table 6: Result of Two Sample Independent-Test between Group A and B.

S.No.	Driving Behavior (n = 391)	Group	Mean	t - test	P - value
1	Errors of drivers	A	1.667	-5.430	0.000***
		B	3.896		
2	Driving behavior (Critical)	A	1.843	-8.192	0.000***
		B	4.119		
3	Propensity for aggression	A	1.129	-8.703	0.000***
		B	3.760		
4	Dula Dangerous driving index	A	1.878	-5.981	0.000***
		B	3.457		

Here, *** is significant at a significance level of 0.01 or significant at 1 percent level.

VI. HYPOTHESIS TESTING

This section is aimed to examine the existence of relationship between offences tendency for four driver behaviors with demographic variables such as gender, level of education, marital status, driving experience and vehicle used by drivers. The entire set of five variables of respondents' characteristics is in nominal/ordinal form. According to previous studies, the chi-square test is usually used to test the relationship between categorical variables. Phi (for smaller data) and Cramer's V (for larger data) correlation multiplier are used to measure the direction and the strength of the relationship.

Results of hypothesis test is shown in Table 7. The finding shows that there is a significant relationship between the tendency to commit aggressive violations and gender at a significance level of .01, and its strength is positively significant at the same level of significance.

Similar results were recorded for tendency of ordinary violations at a significance level of .05 and this proves that male drivers seem to have more tendency of committing ordinary violations compared to female drivers. This study also found that there is a significant relationship between marital status and the tendency to commit lapses and relates negatively at a significance level of .05. This means that single drivers are more likely to commit lapses compared to those who are married. Lastly, the tendency to commit lapses significantly is related to household income group at a significance level of 0.01 and relates positively. This means that the drivers from higher income group possess more tendencies to commit ordinary violations compared to low-income group.

Table 7: Summary of Chi-Square Test of Driving Behavior and Respondents' Characteristics.

	Errors of drivers Tendency (1 &2)		**Driving behavior (Critical) Tendency (1 &2)**		**Propensity for aggression Tendency (1 &2)**		**Dula Dangerous driving index Tendency (1 &2)**	
	Chi-Square value	Coefficient of correlation	Chi-Square value	Coefficient of correlation	Chi-Square value	Coefficient of correlation	Chi-Square value	Coefficient of correlation
Gender	8.491 (.002)***	**Phi** .159 (.002)***	4.003 (.038)**	**Phi** .102 (.038)**	.032 (.731)	**Phi** .002 (.731)	.341 (.514)	**Phi** .013 (.514)
Level of education	.691 (.581)	**Cramer's V** .041 (.581)	.256 (.813)	**Cramer's V** .012 (.813)	.102 (.942)	**Cramer's V .013 (.942)**	.813 (.633)	**Cramer's V .014 (.633)**
Marital status	.158 (.713)	**Phi** .019 (.713)	.202 (.713)	**Phi** -.029 (.713)	.316 (.582)	**Phi -.021 (.582)**	5.013 (.023)**	**Phi** -.101 (.023)**
Driving experience	.328 (.613)	**Phi** .039 (.613)	.391 (.591)	**Phi** .029 (.591)	.199 (.620)	**Phi** .019 (.620)	.510 (.419)	**Phi** .032 (.419)
Vehicle used by drivers	2.773 (.410)	**Cramer's V** .067 (.398)	3.861 (.179)	**Cramer's** V .121 (.153)	4.004 (.271)	**Cramer's V** .102 (.226)	9.347 (.001)***	**Cramer's V** .205 (.001)***

Here,
* significant at a significance level of 0.10
** significant at a significance level of 0.05
*** significant at a significance level of 0.01
1: Low Tendency, 2: High Tendency

VII. CONCLUSION

This study aims to find an overview of driving behavior patterns of road users in Gorakhpur district situated in India. Commuting on road to commute to work and social activities is a necessity in almost every city in India. To relate to accidents statistic, several cases reported show an increasing and disturbing trend. The finding shows that 12.4 percent of drivers are likely to commit errors and 8.9 percent shows the tendency of critical driving behavior. Most of the literature found that both groups of driver's behaviors are statically significant towards road fatalities [20, 21, 22] Even though the study found that the percentages of drivers who commit errors and violations are small, but they cannot leave because they use road networks on daily basis to do their work and for their other social responsibilities. If talking about demographic relationship, young male drivers have higher tendency to do ordinary errors and aggressive violations. Although the education level does not indicate a significant effect on any driving pattern, the vehicles used by drivers and according to their marital status, at least, proves that lapses are mostly committed by drivers of buses and trucks and singles. Lapses can be avoided by enforcing vehicle maker to equip with the latest technology such as reverse automatic sensor, remote sensing and others. Government should also run road safety awareness campaign among new drivers having driving experience less than 2 years.

VIII. RECOMMENDATIONS

Here, some of the recommendations are given that are required to improve road safety in Gorakhpur district. These recommendations are required to improve driver behavior through following:

1. Increase the role of District Police and also the Traffic Police.
2. Usage of latest technologies to monitor driver behavior such as use of cameras and radars.
3. To daily update news report through the local newspapers and local radio stations about the daily road traffic accidents, and also show human casualties or injuries due to these accidents.
4. To force drivers who violate traffic rules to suspend their driving license and also to attend training courses regarding traffic rules and laws.
5. Increase enforcement
6. To follow the new penalty rules provided by Govt. of India for speeding, Rash driving, running red light eating, drinking, using cell phones.
7. To include traffic safety rules and regulations in school courses and also encourage Universities to include such courses in their syllabus.
8. To encourage drivers to drive properly and to obey traffic laws and regulations in every case.
9. To increase patrolling of police on most accident-prone areas and also on dangerous locations and other places.
10. Education and awareness for pedestrians and drivers to decrease road traffic violations.
11. Provide training to all traffic personnel to deal with various software to store and update road accident database for various future research and for future accident prediction.
12. Train drivers with the help of various awareness camps to educate them about common traffic mistakes and other various traffic safety issues.

13. To have more collaboration with Government and Private agencies to improve road safety for reduction in road traffic accidents and crashes in Gorakhpur district and also in Uttar Pradesh State.
14. The urgent need to adopt and implement a practical traffic safety strategy provided by Government of India and other road safety manuals.

IX. FUTURE SCOPE

This study is based on responses received from drivers. The biggest problem during study was to record responses of drivers. It was due to some questionnaire elements like drinking habits and accidents witnessing. Researcher can further study about other road traffic safety indicators because this study includes only one indicator named drivers behavior. The other indicators may be study on helmet users, study on seat-belt users while driving car and their effect on reducing accidents.

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