Effect of Socio-Economic Profile of Drivers on their Critical Driving Behavior : A Questionnaire based Study

Ashutosh Gupta[1] and A. K. Mishra[2]
[1]*Research Scholar, Civil Engineering Department,*
Madan Mohan Malaviya University of Technology, Gorakhpur (U.P.), - 273010 India.
[2]*Associate Professor, Civil Engineering Department,*
Madan Mohan Malaviya University of Technology, Gorakhpur (U.P.), -273010 India.

(Corresponding author: Ashutosh Gupta)

ABSTRACT: Road safety is a serious issue not limited to road authorities but also to the whole country. Road accidents are increasing rapidly in developing nations like India. It is mostly due to a higher no. of accidents involving vehicles on Indian roads. In the present study, Behavior, attitude, errors, and other characteristics of drivers are examined who are traveling in Gorakhpur district, U.P.(India) with help of a questionnaire-based survey. This survey is conducted in Gorakhpur district from December 2019 to March 2020. This questionnaire survey includes various topics such as the age of drivers, type of vehicles used, knowledge of traffic rules, driving experience, accident causes, critical driving behavior, and propensity for the aggression of drivers. The correlation between the socio-economic profile of drivers and their critical driving behavior was studied. Also, the correlation between the propensity for the aggression of drivers and the socio-economic profile of drivers was studied. For this purpose, the Chi-square test has been performed. The result of this study shows that car drivers are majorly involved in the survey stated that most of the accidents occur due to over speeding. Based on this result, this study concludes that there is a requirement of awareness programs regarding traffic rules and also training programs for new drivers having to experience less than 2 years and this will lead to reducing no. of road accidents in Gorakhpur District.

I. INTRODUCTION

Road traffic safety refers to methods and measures for reducing the risk of a person using the road network being killed or seriously injured. The users of road include motorists, cyclists and pedestrians. There are many issues which are related to traffic rule violations like rash driving, over-speeding, drunken driving etc. In this background it is important to promote the road safety awareness programs targeting the road users and drivers. Since, Road safety is a multi-dimensional approach which includes safer design of roads, provision of safer vehicles, supervision of roads. It also depends on traffic management and proper enforcement of rules and regulations. Due to more numbers of unsafe conditions of roads in India, Road traffic accidents are increasing rapidly. According to Ministry of road transportation and highways (Govt. of India) 1,51,113 people were killed and 4,51,361 were injured in 4,49,002 road accidents in India in year 2019. Reason *et al.* (1990), who first investigated driving behavior suggest that errors and violations made by drivers are the main determinants for road accidents [19]. 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 listed below.
Rumar (1985) Stated that almost 95% road accidents are mostly due to human behavior factor, but the questions remain was which human behavior factors governs for this [20]. McLellan *et al.* (1996) found that usage of seat belt can reduce severity of injuries in crashes [13]. Waller *et al.* (1996) found another risky behavior responsible for road traffic accident is taking alcohol and driving [25].
Petridou & Moustaki (2000) found some behavioral factors that stimulate risk taking with a long-term impact; these factors include capacity over estimation, macho attitude, habitual speeding and disregard of traffic laws, non-use of seatbelt and helmet, and crash proneness [18]. Cramer (2003) Stated that cluster analysis of DBQ is capable of clustering the individual rather than the variables [6].
Irershen (2004) discovered that the use of a safety belt is carefully authorized in many developed nations with use goes from 53% to 92% [10]. Deusk (2006) found that knowledge, belief, attitude on risky driving behaviors and driving experience are risky behaviors identified with evidences [8]. Langford *et al.* (2006) found that drivers travelling

more kilometers will typically have lower crash rates per kilometer than those who driving lesser kilometers [12]. Bener & Crunder (2008) found that women driver tends to have higher tendency of violations of traffic rules and lapses compared to male drivers [3]. A DBQ structure was collected by Dewinter & Dodou (2010) to know every driver's socio-segment highlights, driving practices, and self-revealed mishap association encounters [7]. Paleti *et al.* (2010) Stated that perilous or dangerous driving practices are altogether connected with the socio-economic profile of drivers, just as climate and traffic stream; taken together or without help from anyone else, these qualities can prompt road traffic accidents [16]. Peer (2011) stated that driving aptitudes are firmly identified with driving experience: the additional time a driver spends out and about the more experienced that driver [17]. Akalanka *et al.* (2012) found that factors like education level and marital status are also associated with violations and aggressive driving behavior in Sri Lanka [1]. Underwood (2013) any significant correlation between the violations subscale and recorded on-road speed in an instrumented vehicle in novice drivers was not found [23]. Seibokaite *et al.* (2017) demonstrated a positive correlation between violations and two speed measures in an instrumented vehicle study and also found driving errors among Lithuanian drivers [21]. Batool and Carsten (2017) stated that driver's behavior may be influenced by the personal characteristics such marital status, gender and age [2]. Their goal was to summarize previous research done in the field of behavioral observation of road users. For this purpose, they used about 600 journal articles [24]. Danish Farooq *et al.* (2019) studied to find the most critical driving behavior factors which have significant impact on road safety. For this purpose, they use Analytic Hierarchy Process (AHP) over 20 driving behavior factors [9]. Fangrong Chang *et al.* (2019) used 4587 police reported crash data which included motorcycles crashes in Hunan province, China from period of 2015 to 2017 for their study. Their study was aimed to determine contribution of illegal driving behavior to motorcycle crashes in Hunan province, China [5]. Sarbast Moslem *et al.* (2020) in their study used multi-criteria decision making (MCDM) model to rank various driving behavior factors. They proposed AHP-BWM model to rank various driving behavior factors, where BWM stands for Best-Worst method [14]. Sarbast Moslem *et al.* (2020) worked to prioritize various driving behavior factors which is related to road traffic safety. For this purpose, they used decision-making model of Best-Worst Method (BWM) with triangular fuzzy sets. This was used as a solution of optimizing conventional complex decision-making problems [15]. Bener *et al.* (2008) also studied on Qatar and United Arab Emirates. They prepared a DBQ to examine factor structure of DBQ [4]. Kiran Naga *et al.* (2018) also studied on drivers' behavior on national highway 40 in India. They include 23 survey questions in their survey which includes all aspects of road drivers' behavior including their socio-economic profile [11].

II. METHOD OF STUDY

For this study, total no. of 165 questionnaires were circulated among drivers in Gorakhpur district on random basis. Total 128 drivers responded for study. The driver behavior questionnaire (DBQ) was created in three segments. The first segment has questions related to driver's socio-economic profile. In second segment, questions related to critical driving behavior were asked to drivers. In third segment, propensity for aggression was asked to drivers while they were driving.

Socio-economic profile includes drivers from each income group, experienced, new-comers, gender wise, from various job profiles. The main challenge for this study was about accuracy of respondents for recalling accidents and bias over their habits.
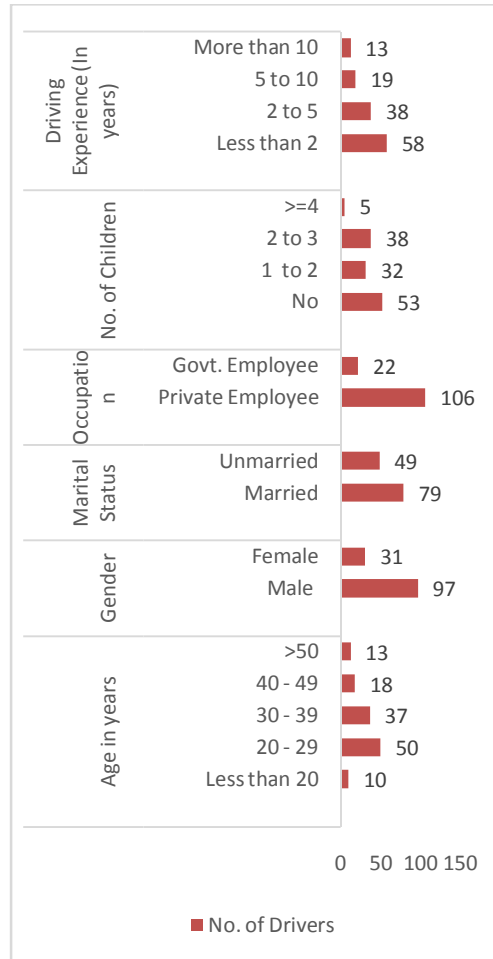
III. RESULTS

Fig.1(a). Socio-economic profile of drivers.

Study of critical driving behavior: The driving behavior (Critical) of drivers were analyzed and results are shown in Table 1.
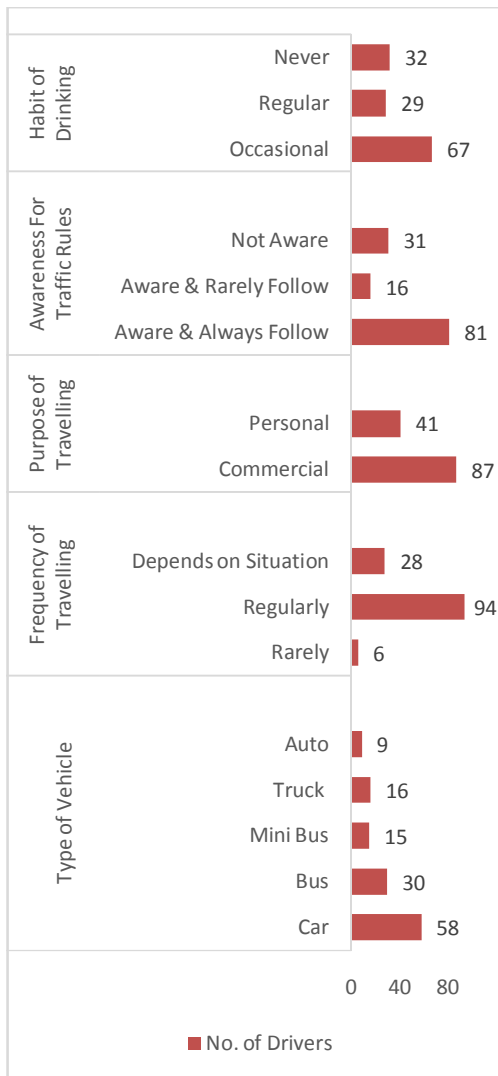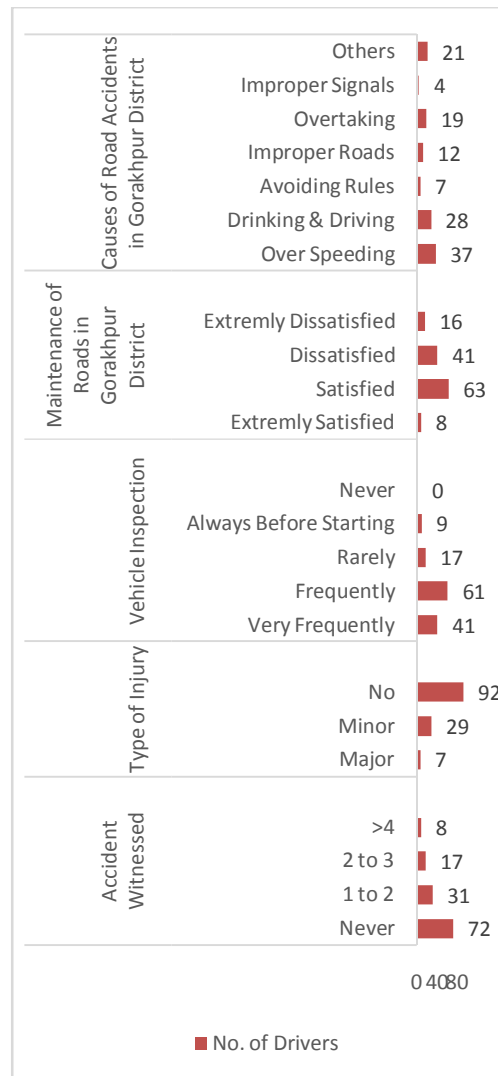
Fig. 1(b). Socio-economic profile of drivers.

Fig. 1(c). Socio-economic profile of drivers.

Table 1: Critical driving behavior.

S. No.	Driving Behavior	Mean	Standard Deviation
1	I forget about where I am going (track)	3.07	1.07
2	I holler at the driver/drivers who make me anxious	3.64	0.92
3	I slow down when moving toward convergences, in any event, when the light is green	3.47	0.50
4	I experience difficulty remaining in the right lane. I float into different lanes	2.70	0.99
5	I forgot to make suitable changes in speed	3.30	1.44
6	I keep a huge distance among myself and the driver before me	3.23	1.54
7	I maintain my speed in order to calm myself down	3.37	1.36
8	I attempt to avoid different vehicles	1.97	1.39
9	I experience difficulty finding the right lane	2.39	1.36
10	I blow my horn at the driver who made me nervous	3.92	1.40
11	During bad weather, I drive more carefully than other vehicles on the road	3.17	0.94
12	I use foulness while I am driving	3.13	0.49
13	I experience issues converging into traffic	2.88	0.33

The results show that the drivers are very often lose track of where they are going, holler at the driver/drivers who make them anxious, slow down when moving toward convergences, in any event, when the light is green, experiences difficulty remaining in the right lane.

They float into other lanes, forgot to make suitable changes in speed, let the driver who made them nervous know that they are upset, maintain a huge distance between themselves and the driver before them, they forget where they are driving to, make gestures at driver/drivers who made them anxious, try to put a decent distance between themselves and other vehicles, timely maintain their speed in order to calm themselves down.

Socio-Economic Profile of Drivers and Their Driving Behavior (Critical):
The driving behavior (Critical) is differing with socio-economic profile of drivers. The relationship between socio-economic profile of drivers and their driving behavior (Critical) was analyzed and the results are presented in below table 3. The distribution of drivers on the basis of their driving behavior (Critical) was studied and the results are shown in Table 2. Responses received from drivers about driving behavior (Critical) have been divided into high level, moderate level and low level. Classification was based on "Mean ± SD" (SD here denotes standard deviation) criterion. The mean score is 77.97 and the SD is 14.15.

Table 2: Distribution of drivers on the basis of their driving behavior (critical).

S. No.	Level of driving behavior	Number of Drivers	%
1	Low	64	49.80
2	Moderate	43	33.40
3	High	21	16.80
	Total	128	100.00

Age Group and Driving Behavior (Critical): The relationship between age group of drivers and driving behavior (Critical) was analyzed and results are shown in Table 3.

Table 3: Age group and driving behavior(critical).

S. No.	Age Group	Level of Driving Behavior(critical)			Total	Chi-Square value	P value
		Low	Moderate	High			
1	Less than 20 years	2(24.32)	5(48.65)	3(27.03)	10	11.053	0.01
2	20 – 29 years	29(57.87)	15(30.46)	6(11.67)	50		
3	30 – 39 years	22(59.44)	10(26.57)	5(13.99)	37		
4	40 – 49 years	6(32.39)	7(40.85)	5(26.76)	18		
5	More than 50 years	4(34.61)	6(42.31)	3(23.08)	13		
	Total	63	43	22	128		

In order to examine the association between age group of drivers and driving behavior (Critical), the chi-square test has been used and the results are presented in Table. The chi square value of 11.053 is significant at one percent level indicating that there is significant association between age group of drivers and driving behavior (Critical).

Educational Qualification and Driving Behavior (Critical):
The relationship between educational qualification of drivers and driving behavior (Critical) was analyzed and results are shown in Table 4.

Table 4: Educational qualification and driving behavior(critical).

S. No.	Educational qualification	Level of Driving Behavior(critical)			Total	Chi-Square value	P value
		Low	Moderate	High			
1	Illiterate	29(64.97)	11(24.29)	5(10.74)	45	10.174	0.000
2	Primary	24(50.27)	15(33.51)	8(16.22)	47		
3	High School	5(32.79)	7(40.98)	4(26.23)	16		
4	Intermediate	4(34.04)	6(46.81)	2(19.15)	12		
5	University	1(16.67)	4(50.00)	3(33.33)	8		
		63	43	22	128		

Table 5: Driving experience and driving behavior(critical).

S. No.	Driving experience	Level of Driving Behavior(critical)			Total	Chi-Square value	P value
		Low	Moderate	High			
1	Less than 2 years	33(56.58)	17(28.95)	8(14.47)	58	12.329	0.000
2	2 – 5 years	22(57.43)	12(31.76)	4(10.81)	38		
3	5 – 10 years	5(28.77)	8(41.09)	6(30.14)	19		
4	More than 10 years	4(27.45)	6(47.06)	3(25.49)	13		
		64	43	21	128		

Chi-square value of 10.174 is significant at one % level which is indicating that there is a significant association between educational qualifications of drivers and driving behavior (Critical). Hence, null hypothesis of there is no such significant association between educational qualifications of drivers and driving behavior (Critical) is rejected. The critical behavior reduced with increase in educational level.

Driving Experience and Driving Behavior (Critical):
The relationship between driving experience of drivers and driving behavior (Critical) was analyzed and results are shown in Table 5.

Chi-square value of 12.329 is significant at one % level which indicates that there is a significant association between driving experiences of drivers and driving behavior (Critical). Hence, the null hypothesis of there is no such significant association between driving experiences of drivers and driving behavior (Critical) is rejected. Critical behavior was observed to be low mainly in the least experienced person.

Vehicles Used by Drivers and Driving Behavior (Critical):
The relationship between vehicles used by drivers and driving behavior (Critical) was analyzed and results are shown in Table 6.

Table 6: Vehicle used by drivers and driving behavior(critical).

S. No.	Vehicle used by drivers	Level of Driving Behavior(critical)			Total	Chi-Square value	P value
		Low	Moderate	High			
1	Car	35(60.52)	17(28.95)	6(10.53)	58	9.294	0.000
2	Bus	15(50.85)	9(31.35)	6(17.80)	30		
3	Truck	6(38.60)	5(36.84)	4(24.56)	15		
4	Auto	5(27.87)	8(50.82)	3(21.31)	16		
5	Mini Bus (Traveller)	3(33.34)	3(33.33)	3(33.33)	9		
		64	42	22	128		

Chi-square value of 9.294 is significant at one % level which indicates that there is a significant association between vehicles used by drivers and driving behavior (Critical). Hence, null hypothesis of there is no such significant association between vehicles used by drivers and driving behavior (Critical) is rejected. The critical behavior was found more among auto and truck drivers.

Propensity for Aggression: The propensity for aggression of drivers was analyzed and results are shown in Table 7.

The results show that the drivers agree with felt annoyed by other road users, felt furious and forceful towards another road user, demonstrated your aggression towards another road user by whatever implies you could, gave chase when rankled by another rider or road user, physically assaulted another driver or vehicle and ridden particularly near a vehicle in front as a sign to its driver to speed up or move.

Table 7: Propensity for Aggression.

S. No.	Propensity for aggression	Mean	SD
1	Felt annoyed by other road users	4.56	0.83
2	Felt furious and forceful towards another road user	3.52	1.73
3	Demonstrated your aggression towards another road user by whatever implies you could	2.25	1.28
4	Gave chase when rankled by another rider or driver	2.06	1.30
5	Physically assaulted another driver or vehicle	1.27	0.81
6	Ridden particularly near a vehicle in front as a sign to its driver to speed up or move	1.44	1.15

Socio-Economic Profile of Drivers and Propensity for Aggression: The propensity for aggression is varying with socio-economic profile of drivers. The relationship between socio-economic profile of drivers and propensity for aggression was studied and results are presented. The distribution of drivers on the basis of propensity for aggression was also studied and results are shown in Table 8. The responses of drivers about propensity for aggression have been divided into high level, moderate level and low level. This classification was based on "Mean ± SD" criterion. The mean score is 17.72 and the SD is 5.14.

Age Group and Propensity for Aggression: The relationship between age group of drivers and propensity for aggression was analyzed and results are shown in Table 9.

Table 8: Distribution of drivers on the basis of propensity for aggression.

S. No.	Level of propensity for aggression	Number of drivers	%
1	Low	24	18.60
2	Moderate	87	68.20
3	High	17	13.20
	Total	128	100.00

Table 9: Age group & propensity for aggression.

S. No.	Age Group	Level of propensity for aggression			Total	Chi square value	Sig.
		Low	Moderate	High			
1	Less than 20 years	2(20.00)	8(80.00)	0(0.00)	10	30.986	0.000
2	20 – 29 years	9(18.27)	31(60.41)	10(21.32)	50		
3	30 – 39 years	6(14.68)	26(71.33)	5(13.99)	37		
4	40 – 49 years	5(26.76)	12(70.42)	1(2.82)	18		
5	More than 50 years	2(15.39)	11(84.61)	0(0.00)	13		
	Total	24	88	16	128		

Out of 10 drivers in the age group of less than 20 years, 80.00 % of drivers opined that the level of propensity for aggression at moderate level followed by 20.00% (low level). Out of 50 drivers in the age group of 20 – 29 years, 60.41% of drivers opined that the level of propensity for aggression at moderate level followed by 21.32% (high level) and 18.27% (low level). Out of 37 drivers in the age group of 30 – 39 years, 71.33% of drivers opined that the level of propensity for aggression at moderate level followed by 14.68% (low level) and 13.99% (high level).

Out of 18 drivers in the age group of 40 – 49 years, 70.42% of drivers opined that the level of propensity for aggression at moderate level followed by26.76% (low level) and 2.82% (high level). Out of 13 drivers in the age group of more than 50 years, 84.61% of drivers opined that the level of propensity for aggression at moderate level followed by 15.39% (low level).

Educational Qualification and Propensity for Aggression: The relationship between educational qualification of drivers and propensity for aggression was analyzed and results are shown in Table 10.

Out of 45 drivers who are illiterates, 64.41% of drivers opined that the level of propensity for aggression at moderate level followed by19.77% (low level) and 15.82% (high level).Out of 47 drivers who have primary education, 65.96% of drivers opined that the level of propensity for aggression at moderate level followed by 17.02% (high level) and 17.02% (low level).Out of 16 drivers who have high school education, 77.05% of drivers opined that the level of propensity for aggression at moderate level followed by 19.67% (low level) and 3.28% (high level).

Out of 12 drivers who have intermediate education, 75.00% of drivers opined that the level of propensity for aggression at moderate level followed by 16.67% (low level) and 8.33% (high level). Out of 8 drivers who have university education, 75.00% of drivers opined that the level of propensity for aggression at moderate level followed by 25.00% (low level).

Driving Experience and Propensity for Aggression: The relationship between driving experience of drivers and propensity for aggression was analyzed and results are shown in Table 11.

Table 10: Educational qualification & propensity for aggression.

S. No.	Educational qualification	Level of propensity for aggression			Total	Chi square value	Sig.
		Low	Moderate	High			
1	Illiterate	9(19.77)	29(64.41)	7(15.82)	45	16.640	0.034
2	Primary	8(17.02)	31(65.96)	8(17.02)	47		
3	High School	3(19.67)	12(77.05)	1(3.28)	16		
4	Intermediate	2(16.67)	9(75.00)	1(8.33)	12		
5	University	2(25.00)	6(75.00)	0(0.00)	8		
	Total	24	87	17	128		

Table 11: Driving experience & propensity for aggression.

S. No.	Driving experience	Level of propensity for aggression			Total	Chi square value	Sig.
		Low	Moderate	High			
1	Less than 2 years	8(14.47)	38(65.79)	12(19.47)	58	27.857	0.00
2	2 – 5 years	8(22.30)	24(64.19)	6(13.51)	38		
3	5 – 10 years	4(21.92)	15(78.08)	0(0.00)	19		
4	More than 10 years	3(27.28)	10(76.92)	0(0.00)	13		
	Total	23	87	18	128		

Out of 58 drivers who have driving experience of less than two years, 65.79% of drivers opined that the level of propensity for aggression at moderate level followed by 19.74% (high level)and 14.47% (low level). Out of 38 drivers who have driving experience of 2 – 5 years, 64.19% of drivers opined that the level of propensity for aggression at moderate level followed by 22.30% (low level) and 13.51% (high level).

Out of 19 drivers who have driving experience of 5 – 10 years, 78.08% of drivers opined that the level of propensity for aggression at moderate level followed by 21.92% (low level). Out of 13 drivers who have driving experience of more than 10 years, 76.92% of drivers opined that the level of propensity for aggression at moderate level followed by 27.28% (low level).

Vehicles Used by Drivers and Propensity for Aggression: The relationship between vehicles used by drivers and propensity for aggression was analyzed and results are shown in Table 12.

Table 12: Vehicle used by drivers & propensity for aggression.

S. No.	Vehicle used by drivers	Level of propensity for aggression			Total	Chi square value	Sig.
		Low	Moderate	High			
1	Car	8(13.16)	37(65.35)	13(21.49)	58	39.249	0.00
2	Bus	7(22.88)	19(66.10)	4(11.02)	30		
3	Truck	4(28.07)	10(66.67)	1(5.26)	15		
4	Auto	4(26.23)	10(72.13)	2(1.64)	16		
5	Mini Bus (Traveller)	1(11.11)	8(88.89)	0(0.00)	9		
	Total	24	84	20	128		

Out of 58 drivers who have used car, 65.35% of drivers opined that the level of propensity for aggression at moderate level followed by 21.49% (high level) and 13.16% (low level). Out of 30 drivers who have used bus, 66.10% of drivers opined that the level of propensity for aggression at moderate level followed by 22.88% (low level) and 11.02% (high level).

Out of 15 drivers who have used truck, 66.67% of drivers opined that the level of propensity for aggression at moderate level followed by 28.07 % (low level) and 5.26% (high level).Out of 16 drivers who have used auto, 72.13% of drivers opined that the level of propensity for aggression at moderate level followed by 26.23% (low level) and 1.64% (high level).Out of 9 drivers who have used mini bus, 88.89% of drivers opined that the level of propensity for aggression at moderate level followed by 11.11% (low level).

IV. DISCUSSIONS

The result of this study shows the socio-demographic profile of drivers and clearly shows that most of drivers were male, aged between 20 to 29 years, married and worked as private employee. Various previous researchers have also considered socio-demographic profile as important objective in their research work and this study results also can be comparable.

Driving experience depends on how much time a driver spends time on driving. After this, knowledge & skills also influence driving experience. As per study results, 58 drivers have less than 2-year experience. 13 drivers have driving experience more than 10 years and most of them are bus drivers. Peer (2011) also indicate about that in their research work [17].

Frequency and purpose of travelling play a big role for occurring accidents on city roads and highways around it. As per study results, 73.43% drivers were travelling regularly in the district and 67.96% drivers are travelling in the district regularly for commercial purpose.

Maintenance of vehicle plays an important role in road traffic safety. Some researchers told in their research work that poor vehicle condition due to improper maintenance can lead to road traffic accidents. In this study, 32.03 % drivers inspect their vehicles very frequently while 47.65 % drivers inspect their vehicles frequently.

When the drivers were asked questions about witnessing of accidents and kind of injury happened while in their driving,56.25% drivers stated that never involved witnessing accidents,71.87% drivers revealed that not involved any kind of injuries happened in accidents.

Avoiding traffic rules, habit of drinking, usage of seat belt plays very important role in occurring

accidents in cities as well as highways. According to study results, 63.28% of drivers answered that they are aware about traffic rules and always follow them, 22.65% drivers revealed that they drink regularly and this regular drinking habit is negative sign for road safety.MC Lellan *et al.* (1996) told in his research that usage of seat belt can reduce severity of road accidents while Steptoe et al. (2002) also told that usage of seat belt is strictly enforced in many developed countries [13, 22].

Since road traffic accidents happen due to various causes. It includes fault from road user, driver, conditions of road, weather, environment etc. If we talk about causes related to drivers, present study revealed that over speeding (28.90%), drinking & driving (21.87%), Avoiding traffic rules (5.46%), improper roads (9.37%) and other reasons (16.40%) are responsible for road accidents in Gorakhpur District. In previous studies, it is also pointed that lack of experience and over speeding are main factors for road accidents.

From study of DBQ, it is clearly seen that most of drivers (50.20%) in Gorakhpur district shows moderate level to high level of critical driving behavior. They float into other lanes, forgot to make suitable changes in speed, let the driver who made them nervous know that they are upset, maintain a huge distance between themselves and the driver before them, they forget where they are driving to, make gestures at driver/drivers who made them anxious, try to put a decent distance between themselves and other vehicles, timely maintain their speed in order to calm themselves down.

V. CONCLUSIONS AND RECOMMENDATIONS

In present study, majority of drivers stated that over-speeding is major cause of road traffic accidents in Gorakhpur district. Based on results of this study, following conclusions and recommendations are proposed to help in reduction of road traffic accidents.

1. The drivers should see traffic lights and obey traffic rules carefully. Simultaneously, the drivers should not disregard the traffic rules and drive securely.

2. The drivers should aware of each traffic sign, speed limits and safety measures in order to avoid road traffic accidents and they should not use cellphones during driving time.

3. The drivers should not be in aggression at the time of driving and should also not drive vehicles after consuming alcohol.

4. The Government should involve in promoting awareness programmes among drivers about traffic laws, road markings and road traffic safety.

5. The traffic police and health personals should work together to implement road safety measures to avoid road traffic accidents.

6. Skill associated driving training programmes should be given to drivers intermittently to improve their aptitudes and information.

7. The findings also suggest for checking of road conditions time to time for their maintenance.

REFERENCES

[1]. Akalanka, E.C., Fujiwara, T., Desapriya, E., Peiris, D.C., Scime, G. (2012). Socio demographic factors associated with aggressive driving behaviors of 3-wheeler taxi drivers in Sri Lanka. Asia Pacific Journal of Public Health, 24(1), 91-103.

[2]. Batool, Z., Carsten, O. (2017). Self-reported dimensions of aberrant behaviors among drivers in Pakistan. Transportation Research Part F: Traffic Psychology and Behavior, 47, 176-186.

[3]. Bener, A., Crundall, D. (2008). Effects of driver behavior on accident involvement: The role of gender and driver behavior in Road Traffic Crashes. International Journal of Crashworthiness, 13(3), 331-336.

[4]. Bener, A., Ozkan, T., Lajunen, T. (2008). The driver behavior questionnaire in Arab Gulf countries: Qatar and United Arab Emirates. Accid. Anal. Prev., *40*(4), 1411-1417.

[5]. Chang, F., Xu, P., Zhou, H., Lee, J., & Huang, H. (2019). Identifying motorcycle high-risk traffic scenarios through interactive analysis of driver behavior and traffic characteristics. *Transportation Research Part F: Traffic Psychology And Behaviour*, *62*, 844-854. doi: 10.1016/j.trf.2019.03.010

[6]. Cramer, D., (2003). Advanced quantitative data analysis. Open University Press. McGraw-Hill Education.

[7]. De, Winter J. C. F., Dodou, D. (2010). The driver behavior questionnaire as a predictor of accidents: a meta-analysis, J. Saf. Res., *41*(6), 463-470.

[8]. Deus, K. (2006) Risk factors and road traffic accidents in Tanzania; a case study of Kibaha district Trondhein.

[9]. Farooq, D., Moslem, S., & Duleba, S. (2019). Evaluation of Driver Behavior Criteria for Evolution of Sustainable Traffic Safety. *Sustainability*, *11*(11), 3142. doi: 10.3390/su11113142

[10]. Irershen, H. (2004). Risk taking attitudes and risk driving behavior. Transportation Research, 7, 135-150.

[11]. Kiran, B. N., Swamy, N. K. (2008). Drivers' opinion on Road Safety for Indian National Highway 40 passing through Kurnool District, Andhra Pradesh-A questionnaire Study. International Journal of Civil Engineering and Technology, 9(6), 37-151.

[12]. Langford, J., Methorst, R., Hakamies-Blomqvist, L. (2006). Older drivers do not have a high crash risk - A replication of low mileage bias. Accident Analysis and Prevention, 38, 574-578.

[13]. Mclellan, B.A., Rizoli, S.B., Brenneman, F.D., Boulanger, B.R., Sharkey, P.W., Szalai, J.P. (1996). Injury pattern and severity in lateral motor vehicle collisions: A Canadian experience. The *Journal of Trauma: Injury, Infection, and Critical Care*, 41, 708-713.

[14]. Moslem, S., Farooq, D., Ghorbanzadeh, O., & Blaschke, T. (2020). Application of the AHP-BWM Model for Evaluating Driver Behavior Factors Related to Road Safety: A Case Study for Budapest. *Symmetry*, *12*(2), 243. doi: 10.3390/sym12020243

[15]. Moslem, S., Gul, M., Farooq, D., Celik, E., Ghorbanzadeh, O., & Blaschke, T. (2020). An Integrated Approach of Best-Worst Method (BWM) and Triangular Fuzzy Sets for Evaluating Driver Behavior Factors Related to Road

Safety. *Mathematics*, *8*(3), 414. doi: 10.3390/math8030414

[16]. Paleti, R., Eluru, N., Bhat, C. R. (2010). Examining the influence of aggressive driving behavior on driver injury severity in traffic crashes. Accident Analysis and Prev., *42*(6), 1839-1854.

[17]. Peer, E. (2011). The time-saving bias, speed choices and driving behavior. Transport. Res. F Traffic Psychol. Behavior, 14(6), 543-554.

[18]. Petridou, E., Moustaki, M. (2000). Human Factors in the Causation of Road Traffic Crashes. European Journal of Epidemiology, 16(9), 819-826.

[19]. Reason, J. T., Manstead, A. S. R., Stradling, S., Baxter, J., Campbell, K. (1990). Errors and violations on the roads: a real distinction? Ergonomics, *33*(10), 1315-1332.

[20]. Rumar, K. (1985). The role of perceptual and cognitive filters in observed behavior. In: Evans, L., Schwing, R.C. (Eds.), Human Behavior and Traffic Safety Plenum Press, New York, 151-165.

[21]. Seibokaite, L., Endriulaitiene, A., Sullman, M.J., Marksaityte, R., Zardeckaite-Matulaitiene, K. (2017). Difficulties in emotion regulation and risky driving among Lithuanian drivers. Traffic Injury Prevention, 18(7), 688-693.

[22]. Steptoe, A., Wardle, J., Fuller, R., Davidsdottir, S., Davou, B., Justo, J. (2002). Seatbelt use, attitudes, and changes in legislation: An international study. American Journal of Preventive Medicine, 23, 254-259.

[23]. Underwood, G. (2013). On-road behavior of younger and older novices during the first six months of driving. Accident Analysis and Prevention, 58, 235-243.

[24]. Van Haperen, W., Riaz, M., Daniels, S., Saunier, N., Brijs, T., & Wets, G. (2019). Observing the observation of (vulnerable) road user behavior and traffic safety: A scoping review. *Accident Analysis & Prevention*, *123*, 211-221. doi: 10.1016/j.aap.2018.11.021

[25]. Waller, F., Stewart, J., Hansen, A. (1996). The potentiating effects of alcohol on driver injury. J Am Med Assoc, 255, 522-527.