ANALYZING DHAKA-MAWA EXPRESSWAY DRIVERS SAFETY PERCEPTIONS BASED ON SELF-REPORTED ACCIDENT HISTORY

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ABSTRACT

The Dhaka-Mawa Expressway segment is a crucial component of the Dhaka-Khulna (N8) Expressway, serving as Bangladesh's pioneering high-speed access-controlled national highway connecting southwestern districts. With the inauguration of the Padma Multipurpose Bridge, traffic on this route has surged. However, this rise in traffic has been accompanied by an alarming increase in road accidents. To comprehend the reasons behind these accidents from the drivers' standpoint, this study delves into an in-depth investigation of expressway safety perceptions among drivers. A precisely designed questionnaire, encompassing drivers' demographic information, driving history, and safety perceptions, was employed. Field survey data was collected from four distinct locations: Postagola, Abdullahpur, Shreenagar, and Mawa Toll Plaza. A random sampling technique yielded responses, which were then analyzed utilizing the ordered logit model with a 95% confidence interval. The model was constructed based on drivers' accident histories. The model shows that drivers frequently neglect vehicle brakes, slow down or stop at intersections, and don't turn on headlights before sunset. They service their vehicles every six months and stay within their lanes to avoid reckless overtaking. Drivers are not always alert and drive within the specified speed limit. They believe the expressway is one-way, but they need to stay focused, obey traffic signals, use side mirrors, and maintain a safe distance for reaction time. Regular vehicle inspections are conducted to reduce road accidents. This study offers valuable insights into drivers' perspectives on road safety along the Dhaka-Mawa Expressway segment. The survey data provides valuable resources for informed decision-making and recommendations for enhanced safety. The findings can guide authorities in taking the necessary actions to mitigate road accidents and provide a solid foundation for formulating targeted strategies and interventions to enhance road safety.

Keywords: *Dhaka-Mawa Expressway, Drivers Safety Perception, Self-Reported Accident History, Mitigate Road Accident, Ordered Logit Model*

1. INTRODUCTION

Road accidents have emerged as a significant societal concern in Bangladesh, particularly in the context of developing countries. The situation is worsening, with thousands of accidents occurring daily. On an annual basis, the statistics are alarming, with approximately 3,000 fatalities and an equal number of grievous and simple injuries stemming from around 3,500 police-reported accidents across the country. Another study conducted by the Accident Research Institute of BUET (2011) revealed even more dire figures, indicating an annual average of 12,000 lives lost and around 35000 injuries due to road accidents [1]. These accidents are not confined to specific locations; they transpire in local areas, cities, and prominently on national highways, regional highways, and district roads. Notably, highways like Dhaka-Chittagong and Dhaka-Rajshahi are particularly susceptible to frequent road accidents. The involvement of heavy vehicles, particularly buses and trucks, remains a predominant factor contributing to the severity of these accidents.

Driving skills are crucial for ensuring traffic safety, as they involve cognitive-motor abilities, information processing, motor skills, and knowledge [3]. They consist of perceptional-motor skills and safety skills, which are related to maneuvering, improving with practice, and increased mileage. Safety skills involve avoiding crashes and increasing safety, such as avoiding unnecessary risks, conforming to speed limits, and obeying traffic lights [4]. A safe driver must have both high perceptional motor and safety skills. Driver behaviors can be classified as errors or violations due to their psychological origins [5]. Errors are failures of planned action related to individual cognitive processes, while violations are deliberate actions to perform or not perform a specific behavior. Both types undermine the safe operation of traffic systems [6]. Research has shown that young drivers often engage in risky behaviors, such as speeding, disobeying road signs, dangerous overtaking, distracted driving, lack of seat belt use, and driving under the influence of alcohol and other substances [7–9]. These behaviors can be linked to adolescence, as ego-centrism, impulsivity, and sensation-seeking are typical adolescent characteristics that diminish with age [10, 11]. Traffic psychologists often focus on personality factors believed to be inherently more dangerous in the traffic environment. Some personality characteristics can be related to risky behaviors in traffic, such as type-A behavior, tenseness, impatience, irritability, negative emotions, and neuroticism [12]. The present study considers time perspective as a possible predictor of risky driving.

Over the last three-decade, driver self-reported instruments such as driver behavior questionnaire has been used by many researchers as a tool to analyze the aberrant driving behavior of drivers and to investigate the relationship between driving behavior and crash risk [13–23]. Driving behavior questionnaire is a self-reported tool in which drivers are asked to rate how often they exhibit a certain driving behavior [24]. A recent meta-analysis by Af-Wahlberg et˚ al. (2015) and De Winter and Dodou (2010) reveals that there are more than 200 studies where driving behavior questionnaire has been used to analyze the driving behavior of drivers [20,21]. It has been observed that drivers who score more on the driving behavior questionnaire scale are more likely to be involved in road crashes in the past and the future [14]. Reason et al. (1990) developed the first driving behavior questionnaire, also known as Manchester driver behavior Questionnaire, to analyze the aberrant driving behavior of drivers in Manchester, U.K [13]. Findings suggest that violation and error have a distinct psychological origin. Since the development of driving behavior questionnaire in 1990 by Reason et al. (1990), the driving behavior questionnaire has been modified in numerous studies to analyze the driving behavior of other road users such as motorcycle riders, truck drivers, cyclists etc [16, 17, 23]. In New Zealand, Sullman et al. (2002) analyzed the driving behavior of professional truck drivers using the 28-item driving behavior questionnaire [23]. Unlike the above studies where only negative driving behaviors were used in the driving behavior questionnaire scale, Ozkan and Lajunen (2005) proposed adding a new factor, “positive driver behavior” to the original driving behavior questionnaire scale [24]. This was based on the fact that during everyday driving, drivers reflect both positive and negative driving behaviors which are associated with their crash involvement. Studies have pointed out that drivers portraying higher on positive driving behaviors tend to drive more politely and safely considering other road users’ comfort and safety. However, very few studies are available in the literature where positive driving behavior has been used as a factor in driving

behavior questionnaire scale for professional bus drivers. For professional bus drivers of China, Han and Zhao (2020) reported that aberrant driving behaviors (errors & violations) were positively associated with drivers' crash involvement, whereas positive driving behavior was negatively associated with crash involvement [25]. The existing studies have some similarities and differences in terms of number of items and cultural difference (i.e., different road culture, regulations, and road safety education). A review of past studies on driver self-reported data reveals that the driving behavior questionnaire will function differently in different countries, different vehicles, and a different road environment.

Therefore, this study begins a thorough investigation of potential dangers to road safety, concentrating in particular on the Dhaka-Mawa Expressway, a crucial route in the transportation system. This study tries to understand the intricate relationships that support road safety, particularly from the viewpoint of drivers. It aims to contribute to a better understanding of the problems with road safety and possible solutions by exploring the connections between driver behavior and safety outcomes. The qualitative aspect of the study simultaneously delves deeply into drivers' opinions. Researchers will investigate the subjective world of driver perceptions, attitudes, and behaviors regarding road safety through surveys and interviews. This qualitative investigation offers a humanistic viewpoint, showing the motivations, concerns, and thought processes that affect drivers' decisions while they're driving. The study goes beyond its academic value and aims to provide concrete advantages to road safety practices by combining quantitative insights, qualitative perspectives, and innovative computational modeling. The results may help guide the development of evidence-based policies that would reduce dangers, improve traffic flow, and increase overall safety along the Dhaka-Mawa Expressway.

2. METHODOLOGY

2.1 Study Area

This study focuses on the Dhaka-Mawa section of the Dhaka-Khulna (N8) Expressway, a 55-km national highway. The expressway consists of two sections: section 1, which covers Dhaka-Mawa, and section 2, covering Panchar-Bhanga. These sections are interconnected to the Padma Multipurpose Bridge, an infrastructure project spanning the Padma River. These projects enhance accessibility and development in the south-western region, connecting Dhaka to 21 isolated districts. The highway (Dhaka-Mawa segment) was reconstructed in order to reduce accidents and increase accessibility. However, the accident rate on this roadway has progressively increased over time. Table 1 shows detailed accident statistics.

Table 1 Police Reported Accident Statistics.

Year	Month	Police Reported Accident, numbers
2017	January-December	26
2018	January-December	24
2019	January-December	11
2020	January-December	12
2021	January-December	29
2022	January-December	50
2023	January-May	30

2.2 Survey Design

This study investigates the safety situations on the Dhaka-Mawa expressway from the driver's perspective using a questionnaire with two components. The first segment captures drivers' demographic profile with ten questions about background information, while the second segment examines highway safety aspects with 17 questions to identify primary contributors. The well-structured questionnaire aims to gain insights into drivers' experiences and perspectives, revealing the overall safety conditions on the Dhaka-Mawa highway.

2.3 Data Collection and Processing

The study collected data from July 12 to 30, 2023, on Saturdays to Fridays after class hours. Two groups were formed, each consisting of two members. To establish credibility, team members wore identification cards and safety vests. Survey sessions were conducted at the Postagola entry point. The team introduced themselves, explained the study's purpose, and encouraged drivers to participate. The survey lasted 10-12 minutes, and the team collected 463 responses on-site. After data collection, the data underwent thorough cleaning and processing to ensure accuracy and reliability. Some responses were excluded, resulting in a final dataset of 451 valid responses suitable for further analysis. The team expressed gratitude to all participants for their valuable contributions to the study.

2.4 Descriptive Analysis

2.4.1 Demographic Information

The survey data presents a comprehensive profile of the respondents' demographic and lifestyle characteristics (Table 2). The respondents were exclusively male, with age groups distributed as follows: a negligible percentage below 18, 6.9% between 18 and 25, 31.9% between 26 and 35, the largest group of 46.8% between 36 and 50, and 14.4% aged 50 or above. Education levels varied, with 45.2% completing primary school, 31.5% high school, 16.6% SSC, 5.3% HSC, and only 1.3% being graduates. Nearly all respondents (98.7%) possessed a driving license, predominantly employed in the private sector (98.9%), while a 1.1% were self-employed. The dominant vehicle owned was buses (98.0%), followed by a few owning trucks (1.3%), and no respondents having motorbikes. Drivers into different categories based on their driving experience, with 6.4% having less than five years of experience, 24.2% having 16-20 years, and 11.8% having over 20 years. Income distribution revealed 8.6% with earnings below Tk. 15,000, 44.3% between Tk. 15,000 and Tk. 20,000, 28.4% between Tk. 20,001 and Tk. 25,000, 10.9% between Tk. 25,001 and Tk. 30,000, and 7.8% earning above Tk. 30,000. Accidents were categorized into fatal injuries (25.9%), minor injuries (34.6%), and no injuries (39.5%). Self-reported risky driver behaviour reveals that 41.7% of participants perceive themselves as low-risk drivers, prioritizing safety, while 33.0% consider themselves high-risk, taking more significant chances on the road. The remaining 25.3% adopt a neutral stance towards their risk level. Marital status included 4.2% unmarried, 90.2% married, and 5.5% divorced respondents. Household sizes ranged from single individuals (0.0%), 14.2% in three-member households, 28.8% in four-member households, 31.0% in five-member households, and 25.9% in households with more than five members. These findings offer valuable insights into the diverse characteristics of the surveyed population, serving as a valuable resource for further analysis and decision-making.

Table 2 Drivers demographic information.

Question	Category	(%)	Question	Category	(%)
Gender	Male	100.0	Vehicle Type	Bus	98.0
Age	<18	0.0		Truck	1.3
	18-25	6.9		Motorbike	0.0
	26-35	31.9		Car	0.7
	36-50	46.8		Others	0.0
	50+	14.4	Monthly Income	Tk. <15,000	8.6
Education	Primary School	45.2		Tk. 15,000-20,000	44.3
	High School	31.5		Tk. 20,001-25,000	28.4
	SSC	16.6		Tk. 25,001-30,000	10.9
	HSC	5.3		Tk. 30,000>	7.8
	Graduate	1.3	Marital Status	Unmarried	4.2
License	Yes	98.7		Married	90.2
	No	0.0		Divorced	5.5
	Applied	1.3	Household Size	2	0.0
Occupation Type	Government	0.0		3	14.2
	Private	98.9		4	28.8
	Self	1.1		5	31.0
Driving Experience, years	<5	6.40		5+	25.9
	5-10	24.60	Self-Reported	Low Risk	41.7
	11-15	33.00	Risky Driver	Neutral	25.3
	16-20	24.20		High Risk	33

20>	11.80

2.4.2 Dependent Variable

Figure 1 presents an overview of drivers' life-oriented accident history. From our data set the responses, it's evident that approximately 28.40% of respondents have never been involved in a road accident. Similarly, 28.40% have experienced one accident, while 24.80% encountered two accidents, 11.30% had three accidents, and 7.10% had more than three accidents. This data offers valuable insights into driver behaviour and risk management, highlighting the need for targeted approaches to improve road safety, considering driving experience and self-perceived risk levels. Analysing this information can aid in developing more effective strategies to promote safe driving practices and reduce accidents on the road.

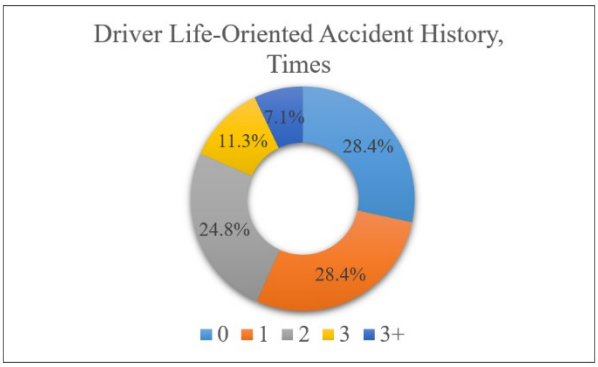

Figure 1 Drivers self-reported accident history.

2.4.3 Independent Variable

Table 3 presents the results of a survey or study assessing the attitudes and behaviours of individuals towards various traffic-related practices. The data is collected using a Likert scale, where respondents indicate their level of agreement or disagreement with statements related to different driving habits. The five options on the Likert scale are represented by the following abbreviations: SA (Strongly Agree), A (Agree), D (Neutral), SD (Disagree), and N (Strongly Disagree). The majority of respondents 79.8% agree and strongly agree that maintaining brakes regularly is important to avoid sudden brake failure. A significant majority 57.6% strongly agree that slowing down or stopping at intersections enhances safety. Almost all respondents 98.2% agree and strongly agree that turning on headlights before sunset improves visibility. The highest percentage of respondents 65.2% strongly agree that servicing the vehicle every six months is necessary. Most respondents 67.4% agree that staying within their lane and avoiding reckless overtaking is important. A substantial proportion 62.8% strongly agree that staying alert and awake while driving is crucial. The majority 84% strongly agree that picking up passengers only from designated stoppage areas enhances safety. A significant number of respondents 72.9% agree that they drive when healthy and fit. The highest percentage 79.6% agree that driving within the specified speed limit is important. A notable percentage 54.6% agree that they are familiar with traffic education. Most respondents 71.4% agree that staying focused on driving and avoiding phone use reduces distractions. A significant proportion 65% agree that obeying traffic signals and signs is important. A substantial number of respondents 44.3% agree that using side mirrors before merging onto an expressway is crucial. A notable percentage 55.9% agree that proper street lighting enhances safety. A large majority 88% agree that maintaining a safe distance from the vehicle ahead is important. A significant percentage 41.9% agree that conducting regular vehicle inspections is necessary. Most respondents 75.4% strongly agree that one-way roads reduce accidents. These results provide insights into people's attitudes and behaviours related to safe driving practices. The levels of agreement or disagreement reflect the overall perception and understanding of these practices among the respondents.

Table 3 Independent variables responses.

SL	Independent Variables	SD	D	N	A	SA
x_1	Make sure to maintain your brakes regularly to avoid	4.90	10.00	5.30	48.30	31.50

	sudden brake failure.					
x_2	Slow down or stop when approaching intersections for added safety.	0.00	0.00	0.00	42.40	57.60
x_3	Turn on your headlights before sunset for better visibility.	0.00	1.80	0.00	90.20	8.00
x_4	Servicing the vehicle every Six months	1.10	3.50	3.50	26.70	65.20
x_5	Stay within your lane and avoid overtaking recklessly.	0.00	5.50	9.30	67.40	17.80
x_6	Stay alert and awake while driving.	2.40	2.40	2.00	30.40	62.80
x_7	Pick up passengers only from designated stoppage areas for safety reasons.	0.00	0.90	2.00	13.10	84.00
x_8	I drive when I am healthy and fit.	1.10	2.90	5.80	17.30	72.90
x_9	Driving within the specified speed limit	0.40	2.70	0.70	16.60	79.60
x_{10}	Are you familiar with traffic education?	3.30	0.00	6.40	35.70	54.60
x_{11}	Stay focused on driving and avoid using your phone to reduce distractions.	5.30	0.00	4.00	19.30	71.40
x_{12}	Obey all traffic signals and signs.	2.40	0.00	3.30	29.30	65.00
x_{13}	Properly use the side mirror before merging onto an expressway.	0.40	4.90	7.50	44.30	42.90
x_{14}	Ensure proper street lighting to enhance safety.	0.40	14.40	12.90	16.40	55.90
x_{15}	Keep a safe distance from the vehicle ahead to allow for reaction time.	0.00	0.00	0.00	88.00	12.00
x_{16}	Conduct Regular Vehicle inspections.	0.00	17.70	4.20	41.90	36.20
x_{17}	One-way roads reduce accidents.	2.70	3.80	2.00	16.20	75.40

Likert Scale: 1=Strongly Disagree (SD), 2=Disagree (D), 3=Neutral (N), 4=Agree (A), 5=Strongly Agree (SA)

2.5 Ordered Logit Model

Ordered logit model, also known as Proportional odds (PO) model, is usually defined in a latent (i.e., unobserved) variable framework. The general specification of each single equation model is $y*$,

$$y_i^{¿} = x_i^{'}\beta + u_i$$

$$y_i = jif \alpha_{j-1} < y_i^{¿} \le \alpha_j$$

The probability that observation i will select alternative j is:

$$p_{ij} = p(y_i = j) = p(\alpha_{j-1} < y_i^{¿} \le \alpha_j - x_i^{¿}\beta) - F(\alpha_{j-1} - x_i^{¿}\beta)$$

For the ordered logit, F is the logistic cdf

$$F = (z) = e^z / (1 + e^z)$$

In the analysis the probability of driver's accident conducted history has 5-category ordinal response variable (0, 1, 2, 3, 3+ times) in an ordered logit model can be represented as follows.

Cumulative Probability for 0 times accident history:

$$p(y \le 0) = \frac{1}{1 + \exp(\alpha_1 - \beta_1 x_1 - \beta_2 x_2 - ... - \beta_k x_k)}$$

Cumulative Probability for 1 times accident history:

$$p(y \le 1) = \frac{1}{1 + \exp(\alpha_2 - \beta_1 x_1 - \beta_2 x_2 - ... - \beta_k x_k)} * (1 - \frac{1}{1 + \exp(\alpha_1 - \beta_1 x_1 - \beta_2 x_2 - ... - \beta_k x_k)})$$

Cumulative Probability for 2 times accident history:

$$p(y \le 2) = \frac{1}{1 + \exp(\alpha_3 - \beta_1 x_1 - \beta_2 x_2 - ... - \beta_k x_k)} * (1 - \frac{1}{1 + \exp(\alpha_2 - \beta_1 x_1 - \beta_2 x_2 - ... - \beta_k x_k)})$$

Cumulative Probability for 3 times accident history:

$$p(y \le 3) = \frac{1}{1 + \exp(\alpha_4 - \beta_1 x_1 - \beta_2 x_2 - ... - \beta_k x_k)} * (1 - \frac{1}{1 + \exp(\alpha_3 - \beta_1 x_1 - \beta_2 x_2 - ... - \beta_k x_k)})$$

Cumulative Probability for 3+ times accident history:

$$p¿$$

Where: $P(Y \leq j)$ is the cumulative probability that the response variable (Y) falls in category (j) or a lower category. (α_j) is the intercept term for category (j).$(\beta¿¿1, \beta_2, ... \beta_k)¿$ are the coefficients for predictor variables$(x¿¿1, x_2, ... x_k)¿$ respectively. The marginal effect of an increase in a regressor x_r on the probability of selecting alternative j is:

$$\partial p_{ij} / \partial x_{ri} = F'(\alpha_{j-1} - x_i'\beta) - F'(\alpha_j - x_i'\beta)\beta_r$$

The marginal effects of each variable on the different alternatives sum up to zero. It is interpretation for each unit increase in the independent variable increases/decreases the probability of selecting alternative j by the marginal effect expressed as a percent.

3. RESULTS

3.1 Goodness of Fit Measures

The Table 4 presents various goodness of fit measures for an ordered logit model, offering valuable insights into the model's performance. The log likelihood, calculated as -621.146, indicates how well the model predicts the observed data. A higher log likelihood value signifies a better fit, and in this case, the negative value suggests a reasonably good fit. The LR chi-square (160.210 with 17 degrees of freedom) tests whether the model significantly improves upon a baseline model with no predictors. The accompanying p-value of 0.000 indicates strong statistical significance, confirming that the model is indeed a good fit for the data. The pseudo R2, standing at 0.079, represents the proportion of variance in the dependent variable explained by the model. While not as high as linear regression R2 values, this pseudo R2 still showcases the model's predictive power, explaining approximately 7.9% of the outcome's variability. Moreover, the AIC (Akaike Information Criterion) and BIC (Bayesian Information Criterion) values, at 1284.292 and 1370.633 respectively, serve as model selection criteria. Both AIC and BIC consider model fit and complexity, with lower values indicating better balance. In this case, the lower AIC and BIC values suggest that the model is appropriately fitted and adequately complex. Taken together, the results from this goodness of fit measures indicate that the ordered logit model is well-suited to the data and offers valuable insights into the relationships between variables.

Table 4 Model goodness of fit measures.

Fit Measure		Value
Log likelihood	=	-621.146
Number of observations	=	451.000
LR chi2(21)	=	106.210
Prob > chi2	=	0.000
Pseudo R2	=	0.079
AIC	=	1284.292
BIC	=	1370.633

3.2 Coefficient Estimates

Table 5 shows ordered logit model coefficients, standard errors, z value, p-values, 95% confidence intervals, and odds ratio. It provides a small portion of the analysis of dependent and independent variable connections. The coefficients are evaluated in relation to each category, sigh, and significance range. A positive sign indicates that an increase in a variable increases respondents' likelihood of being in that group, while negative sign indicates reverse trends. Parameter estimation indicates that $(x_2, \beta_2 = 0.843; p < 0.001)$, ¿), $(x_5, \beta_5 = 0.745; p < 0.001)$, ¿), ¿), $(x_{12}, \beta_{12} = 0.413; p < 0.001)$, $(x_{13}, \beta_{13} = 0.235; p < 0.05)$, $(x_{15}, \beta_{15} = 0.596; p < 0.05)$, $(x_{16}, \beta_{16} = 0.200; p < 0.05)$, $(x_{17}, \beta_{17} = 0.369; p < 0.001)$ those are positively Significant.

Simultaneously, a odds ratio (OR) controls over other predictor variables in a model. It gives an idea of the dynamics between the predictors. Maintain your brakes regularly to avoid sudden brake failure. The odds of having an accident are 1.100 times higher if you don't maintain your brakes regularly.

Slow down or stop when approaching intersections for added safety. The odds of having an accident are 2.324 times higher if you don't slow down or stop at intersections. Turn on your headlights before sunset for better visibility. The odds of having an accident are 1.046 times lower if you turn on your headlights before sunset. Service your vehicle every Six months. The odds of having an accident are 1.339 times lower if you service your vehicle every six months. Stay within your lane and avoid overtaking recklessly. The odds of having an accident are 2.106 times lower if you stay within your lane and avoid overtaking recklessly. Stay alert and awake while driving. The odds of having an accident are 1.058 times higher if you don't stay alert and awake while driving. Pick up passengers only from designated stoppage areas for safety reasons. The odds of having an accident are 1.593 times lower if you pick up passengers only from designated stoppage areas. Drive when you are healthy and fit. The odds of having an accident are 1.253 times lower if you drive when you are healthy and fit. Drive within the specified speed limit. The odds of having an accident are 1.212 times lower if you drive within the specified speed limit. Be familiar with traffic education. The odds of having an accident are 1.061 times higher if you are not familiar with traffic education. Stay focused on driving and avoid using your phone. The odds of having an accident are 1.209 times lower if you stay focused on driving and avoid using your phone. Obey all traffic signals and signs. The odds of having an accident are 1.511 times lower if you obey all traffic signals and signs. Properly use the side mirror before merging onto an expressway. The odds of having an accident are 1.265 times lower if you properly use the side mirror before merging onto an expressway. Ensure proper street lighting to enhance safety. The odds of having an accident are 1.065 times higher if there is not proper street lighting. Keep a safe distance from the vehicle ahead to allow for reaction time. The odds of having an accident are 1.815 times lower if you keep a safe distance from the vehicle ahead. Conduct Regular Vehicle inspections. The odds of having an accident are 1.222 times lower if you conduct regular vehicle inspections. One-way roads reduce accidents. The odds of having an accident are 1.447 times lower on one-way roads.

Table 5 Ordered logit model estimates.

$Y_{Accident}$	Coefficient	Standard Error	Z value	P value	95% confidence interval		Odds ratio
					Lower	Upper	
x_1	0.095	0.078	1.22	0.221	-0.057	0.248	1.1
x_2	0.843	0.193	4.38	0.000***	0.466	1.221	2.324
x_3	0.045	0.218	0.21	0.836	-0.383	0.473	1.046
x_4	0.292	0.108	2.71	0.007**	0.081	0.503	1.339
x_5	0.745	0.133	5.62	0.000***	0.485	1.004	2.106
x_6	0.057	0.115	0.49	0.622	-0.169	0.282	1.058
x_7	0.466	0.184	2.54	0.011*	0.106	0.825	1.593
x_8	0.225	0.125	1.8	0.072	-0.02	0.47	1.253
x_9	0.192	0.143	1.34	0.179	-0.088	0.473	1.212
x_{10}	0.059	0.107	0.56	0.578	-0.15	0.268	1.061
x_{11}	0.19	0.095	2	0.045*	0.004	0.376	1.209
x_{12}	0.413	0.121	3.42	0.001***	0.177	0.649	1.511
x_{13}	0.235	0.113	2.09	0.037*	0.014	0.456	1.265
x_{14}	0.063	0.08	0.79	0.431	-0.094	0.219	1.065
x_{15}	0.596	0.302	1.97	0.049*	0.003	1.188	1.815
x_{16}	0.2	0.091	2.19	0.028*	0.021	0.379	1.222
x_{17}	0.369	0.107	3.45	0.001***	0.16	0.579	1.447
/cut1	21.157	2.81		***	15.649	26.665	21.157
/cut2	22.571	2.832		***	17.021	28.121	22.571
/cut3	24.006	2.857		***	18.406	29.606	24.006
/cut4	25.224	2.881		***	19.577	30.871	25.224

Note: Significant level * p<0.05, ** p<0.01, *** p<0.001

3.5 Marginal Effects

Table 6 shows the marginal effects of the ordered logit model. Drivers ensure that vehicle brakes are maintained on a regular basis to avoid abrupt brake failure (x1), which is statistically insignificant and reduces the accident probability of "0" and "1" times by 1.7% and 0.6%, respectively. While accidents occurring "2", "3", and "3+" times are statistically insignificant, the likelihood of an accident occurring increases by 1.1%, 0.8%, and 0.5%, respectively. They slow down or stop when approaching intersections for added safety (x2), which is statistically significant and reduces the accident probability of "0" and "1" times by 15.4% and 5.4%, respectively. While accidents occurring "2", "3", and "3+" times are statistically significant, the likelihood of an accident occurring increases by 9.7%, 6.9%, and 4.1%, respectively. Turn on your headlights before sunset for better visibility (x3), which is statistically insignificant and reduces the accident probability of "0" and "1" times by 0.8% and 0.3%, respectively. While accidents occurring "2", "3", and "3+" times are statistically insignificant, the likelihood of an accident occurring increases by 0.5%, 0.4%, and 0.2%, respectively. They servicing the vehicle every six months (x4), which is statistically significant and reduces the accident probability of "0" and "1" times by 5.3% and 1.9%, respectively. While accidents occurring "2", "3", and "3+" times are statistically significant, the likelihood of an accident occurring increases by 3.4%, 2.4%, and 1.4%, respectively. They driving within own lane and avoid overtaking recklessly (x5), which is statistically significant and reduces the accident probability of "0" and "1" times by 13.6% and 4.7%, respectively. While accidents occurring "2", "3", and "3+" times are statistically significant, the likelihood of an accident occurring increases by 8.5%, 6.1%, and 3.6%, respectively. Stay alert and awake while driving (x6), which is statistically insignificant and reduces the accident probability of "0" and "1" times by 1.0% and 0.4%, respectively. While accidents occurring "2", "3", and "3+" times are statistically insignificant, the likelihood of an accident occurring increases by 0.7%, 0.5%, and 0.3%, respectively. Pick up passengers only from designated stoppage areas for safety reasons (x7), which is statistically significant and reduces the accident probability of "0" and "1" times by 8.5% and 3.0%, respectively. While accidents occurring "2", "3", and "3+" times are statistically significant, the likelihood of an accident occurring increases by 5.3%, 3.8%, and 2.3%, respectively. I drive when I am healthy and fit (x8), which is statistically insignificant and reduces the accident probability of "0" and "1" times by 4.1% and 1.4%, respectively. While accidents occurring "2", "3", and "3+" times are statistically insignificant, the likelihood of an accident occurring increases by 2.6%, 1.9%, and 1.1%, respectively. Driving within the specified speed limit (x9), which is statistically insignificant and reduces the accident probability of "0" and "1" times by 3.5% and 1.2%, respectively. While accidents occurring "2", "3", and "3+" times are statistically insignificant, the likelihood of an accident occurring increases by 2.2%, 1.6%, and 0.9%, respectively. Drivers are you familiar with traffic education (x10), which is statistically insignificant and reduces the accident probability of "0" and "1" times by 1.1% and 0.4%, respectively. While accidents occurring "2", "3", and "3+" times are statistically insignificant, the likelihood of an accident occurring increases by 0.7%, 0.5%, and 0.3%, respectively. Stay focused on driving and avoid using your phone to reduce distractions (x11), which is statistically significant and reduces the accident probability of "0" times by 3.5% and "1" time accident conducted is statistically insignificant and reduces the accident probability of times by 1.2%. While accidents occurring "2", "3", and "3+" times are statistically insignificant, the likelihood of an accident occurring increases by 2.2%, 1.6%, and 0.9%, respectively. Obey all traffic signals and signs (x12), which is statistically significant and reduces the accident probability of "0" and "1" times by 7.5% and 2.6%, respectively. While accidents occurring "2", "3", and "3+" times are statistically significant, the likelihood of an accident occurring increases by 4.7%, 3.4%, and 2.0%, respectively. Properly use the side mirror before merging onto an expressway (x13), which is statistically significant and reduces the accident probability of "0" times by 4.3% and "1" time accident conducted is statistically insignificant and reduces the accident probability of times by 1.5%. While accidents occurring "2", "3", and "3+" times are statistically significant, the likelihood of an accident occurring increases by 2.7%, 1.9%, and 1.1%, respectively. Ensure proper street lighting to enhance safety (x14), which is statistically insignificant and reduces the accident probability of "0" and "1" times by 1.1% and 0.4%, respectively. While accidents occurring "2", "3", and "3+" times are statistically insignificant, the likelihood of an accident occurring increases by 0.7%, 0.5%, and 0.3%, respectively. Keep a safe distance from the vehicle ahead to allow for reaction time (x15), which is

statistically significant and reduces the accident probability of "0" times by 10.9% and "1" time accident conducted is statistically insignificant and reduces the accident probability of times by 3.8%. While accidents occurring "2", "3", and "3+" times are statistically insignificant, the likelihood of an accident occurring increases by 6.8%, 4.9%, and 2.9%, respectively. Conduct Regular Vehicle inspections (x16), which is statistically significant and reduces the accident probability of "0" and "1" times by 3.6% and 1.3%, respectively. While accidents occurring "2", "3", and "3+" times are statistically significant, the likelihood of an accident occurring increases by 2.3%, 1.6%, and 1.0%, respectively. One-way roads reduce accidents (x17), which is statistically significant and reduces the accident probability of "0" and "1" times by 6.7% and 2.3%, respectively. While accidents occurring "2", "3", and "3+" times are statistically significant, the likelihood of an accident occurring increases by 4.2%, 3.0%, and 1.8%, respectively.

Table 6 Marginal effects.

$Y_{Accident}$	Accident Conducted, times									
	0		1		2		3		3+	
	dy/dx	P value	dy/dx	P value	dy/dx	P value	dy/dx	P value	dy/dx	P value
x_1	-0.017	0.220	-0.006	0.241	0.011	0.224	0.008	0.227	0.005	0.231
x_2	-0.154	0.000*	-0.054	0.001*	0.097	0.000*	0.069	0.000*	0.041	0.000*
x_3	-0.008	0.836	-0.003	0.836	0.005	0.836	0.004	0.836	0.002	0.836
x_4	-0.053	0.007*	-0.019	0.023*	0.033	0.010*	0.024	0.010*	0.014	0.012*
x_5	-0.136	0.000*	-0.047	0.000*	0.085	0.000*	0.061	0.000*	0.036	0.000*
x_6	-0.010	0.622	-0.004	0.623	0.007	0.623	0.005	0.622	0.003	0.623
x_7	-0.085	0.011*	-0.030	0.028*	0.053	0.015*	0.038	0.015*	0.023	0.018*
x_8	-0.041	0.074	-0.014	0.088	0.026	0.077	0.019	0.079	0.011	0.083
x_9	-0.035	0.179	-0.012	0.200	0.022	0.187	0.016	0.183	0.009	0.186
x_{10}	-0.011	0.577	-0.004	0.582	0.007	0.578	0.005	0.579	0.003	0.580
x_{11}	-0.035	0.046*	-0.012	0.066	0.022	0.051	0.016	0.052	0.009	0.054
x_{12}	-0.075	0.001*	-0.026	0.007*	0.047	0.002*	0.034	0.002*	0.020	0.002*
x_{13}	-0.043	0.036*	-0.015	0.063	0.027	0.041*	0.019	0.045*	0.011	0.048*
x_{14}	-0.011	0.432	-0.004	0.437	0.007	0.433	0.005	0.433	0.003	0.435
x_{15}	-0.109	0.049*	-0.038	0.074	0.068	0.054	0.049	0.058	0.029	0.056
x_{16}	-0.036	0.028*	-0.013	0.050*	0.023	0.033*	0.016	0.035*	0.010	0.036*
x_{17}	-0.067	0.001*	-0.023	0.005*	0.042	0.001*	0.030	0.001*	0.018	0.002*

Note: Significant at * $p<0.05$ (minimum)

4. DISCUSSIONS

This study explores the Dhaka-Mawa (N8) Expressway driver's safety scenarios from drivers' perspectives on the basis of the driver's life-oriented accident history. From the analysis, it is found that they do not always make sure to maintain vehicle brakes regularly to avoid sudden brake failure. Thus, accidents often happen. But one thing they do is slow down or stop when approaching intersections for added safety. Which is good practice to mitigate road accidents. But they are not always turned on before sunset for better visibility. This is also a greater reason for road accidents. Even if the headlight is broken, without maintenance, they drive risky. One important finding is that they service the vehicle every six months. This is good practice for safe driving. Moreover, drivers should stay within their lane and avoid overtaking recklessly. This is a good initiative, as the highway has a separate two-way lane that definitely minimizes accidents and promotes safe driving. But they are not always alert and awake while driving. Because during survey time, we found many drivers are often smoking, listening to music, and having frequent conversations with helpers, contractors, and even passengers. They pick up passengers only from designated stoppage areas for safety reasons. They do not always drive when they are healthy and fit. Because of the unemployment risk. They are not driving within the specified speed limit. They stated that this highway is one-way, so they feel

safe to drive at high speeds. Initially, they were not familiar with world-class traffic regulation, but now they are still learning. However, staying focused on driving and avoiding using your phone to reduce distractions indicates safe driving practice. And they obey all traffic signals and signs and properly use the side mirror before merging onto an expressway. They believe proper street lighting enhances road safety. Sometime at late night, many vehicles are robbed, so sufficient street lighting might reduce crime. They keep a safe distance from the vehicle ahead to allow for reaction time. Regularly, they conduct vehicle inspections for safety purposes. Drivers strongly believe that this expressway is one-way, which reduces road accidents.

5. CONCLUSIONS

This study investigates the safety situations of Dhaka-Mawa (N8) Expressway drivers by studying their life-oriented accident history. The results provide insight into a number of areas, including risk management, driving behaviour, and the sociodemographic profile of the sampled drivers. The majority of responders were male and between the ages of 18 and 50, with different educational qualifications. The majority drivers were worked in the private sector and had driver's licenses, but their preferred mode of transportation was buses. When accidents were classified, the respondents' experiences showed a wide variety. A little over 28.40% of respondents said they had never been in a vehicle accident, whilst other respondents had varied accident rates. The report draws attention to issues with vehicle maintenance, especially the haphazard brake maintenance that increases the risk of accidents. On the other hand, safe driving habits, such reducing speed at stop signs and having a vehicle serviced every six months, show that drivers value their safety. Despite admirable methods, there is opportunity for development. There is a higher danger of accidents before dark since many vehicles don't always use their headlights. Road safety is also hampered by problems like driving while distracted by smoking, music, or mobile conversations, as well as by not always operating a vehicle in its good health. Although drivers see the expressway's one-way layout as a safety factor, there is still need for better understanding and respect to international traffic laws. Drivers' dedication to use side mirrors, stopping at stop signs, and keeping a safe distance from cars in front of them is encouraging. An important factor in road safety is adequate street light, which helps reduce the risk of late-night crimes. In summary, this analysis offers a thorough knowledge of the drivers of the Dhaka-Mawa Expressway and is a useful resource for next assessments and decision-making. Improving the expressway's overall road safety can be facilitated by addressing the areas that have been highlighted for improvement.

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