MODELING DHAKA-KHULNA (N8) EXPRESSWAY SAFETY SCENARIOS FROM DRIVER PERSPECTIVES

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ABSTRACT

The Dhaka-Khulna (N8) Expressway, our country's first high-speed access-controlled national roadway, has become accident-prone. Thus, it is important to investigate the factors that influence drivers' sense of safety while driving. This paper examines safety scenarios on the Dhaka-Khulna (N8) Expressway, focusing on drivers' perspectives. A questionnaire is prepared to gather driver demographic profiles and safe driving factors. A dataset of 451 responses was collected using random sampling. An ordered logit model is used to analyze three distinct models, capturing drivers' self-reported risky driving behaviors, cumulative driving experiences, and accidents. The results show strong correlations between these models and existing safety scenarios, enhancing our understanding of the complex interplay between driver behaviors, experiences, and safety conditions. These findings have significant implications for policymakers, urban planners, and other stakeholders in road safety management. By highlighting factors influencing safety, this research contributes valuable insights for proactive measures to mitigate risks, reduce accidents, and ensure a secure driving environment for all users.

Keywords: *Dhaka-Khulna (N8) Expressway, Existing safety scenarios, Driver perspectives, Ordered logit model*

1. INTRODUCTION

Traffic accidents and fatalities are a major social and public health problem worldwide. According to the World Health Organization (WHO), 1.25 million people died in traffic accidents in 2015 [1]. In Bangladesh, road accidents are a significant societal concern, especially 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 serious and minor injuries resulting from around 3,500 police-reported accidents across the country [2]. However, a 2011 study by the Accident Research Institute of BUET revealed even more dire figures, indicating an annual average of 12,000 deaths and around 35,000 injuries due to road accidents.

Driver attributes are consistent and long-lasting patterns of an individual's emotions, ideas, and behaviors [3]. According to studies, it is linked to unsafe driving habits and traffic accidents [4], [5]. The Eysenck Personality Questionnaire (EPQ) is used in one study to assess driver personality traits. The EPQ is a three-factor personality model that includes extraversion, neuroticism, and psychoticism [6]. Extraversion is distinguished by friendliness and a preference for pleasant feelings [7]. Neuroticism is distinguished by unpleasant feelings and difficulty in problem resolution [8]. Psychoticism is characterized by aggression and a need for stimulation [9]. Previous study has found that extraversion and neuroticism are associated to risky driving behaviors and traffic accidents. The evidence for a link between psychoticism and motor accidents is equivocal.

Driving experience is also a factor that can predict driving behaviors and accident risk. While age and driving experience are often linked, research shows that driving experience has an independent effect on driving behavior [10]. Younger/novice drivers are more likely to underestimate the risks of driving and therefore have a higher crash risk than older/experienced drivers [11], [12]. However, there is evidence that aberrant driving behaviors (e.g., speeding and hostility towards other drivers) and traffic offenses increase within the first three years after licensure [13], [14]. Driving experience over the first three years is also positively correlated with risky attitudes towards driving violations [15]. Few studies have specifically examined the effects of driving experience on driving behaviors in a systematic model in relation to personality traits.

Self-reported traffic crash studies have been conducted in various regions, including Europe, North America, and Australasia, but there are few studies in developing countries [16]. These studies primarily focus on adult road users and car users, using questionnaires as the most common method of data collection [17]. The studies show that researchers generally trust self-reports, despite their drawbacks [18]. Additionally, distractions while driving have been found to significantly increase the odds of serious crashes [19]. Older drivers have been found to diligently self-report collisions, although there may be discrepancies between self-reports and official records [20]. Self-reported driving speeds have been compared to speeds estimated from kinematic reconstruction, showing a good linear correlation but with some discrepancies. Overall, self-reported data has been found to be reliable for analyzing accident liability, with consistent results obtained across different surveys.

The Dhaka-Khulna (N8) is Bangladesh's first access-controlled national highway, connecting the capital city of Dhaka to 21 isolated districts in the southwest. It is now experiencing a high rate of accidents [21]. No previous study has explored the safety scenarios of the Dhaka-Khulna (N8) Expressway from the driver's perspective. This study fills this gap by introducing three distinct models (self-reported risky driving, driving experience, and accident conducts) to capture the safety scenarios faced by drivers on this road. The findings from this research are expected to contribute to reducing road accidents on the Dhaka-Khulna Expressway by providing valuable insights for policymakers and relevant road authorities to implement informed countermeasures for accident prevention.

2. MATERIALS AND METHOD

Data

This study focuses on the Dhaka-Khulna (N8) Expressway, a 55-kilometer national highway. It connects the Padma Multipurpose Bridge, which spans the Padma River. These projects improve accessibility and growth in the southwest area by connecting Dhaka to 21 outlying districts. This study uses a questionnaire with two components to assess the safety situations on the Dhaka-Khulna expressway from the driver's perspective. The first half investigates highway safety elements with 21 questions to identify main contributors, while the second portion gathers drivers' demographic profile with 10 questions concerning background information. The well-structured questionnaire is designed to elicit information about drivers' experiences and perspectives, exposing the overall safety conditions on the Dhaka-Khulna highway. The study collected data from July 12 to 30, 2023, on Saturdays to Fridays. Two groups were formed, each with two members. Identification cards and safety vests were worn by team members to build credibility. Surveys were carried out at the Postagola entry point. The team introduced itself, described the goal of the study, and invited drivers to take part. The poll lasted 10 to 12 minutes, and the researchers received 463 responses on the spot. Following data collection, the data was thoroughly cleaned and processed to ensure accuracy and dependability. Some replies were eliminated, yielding a final dataset of 451 valid responses appropriate for further analysis. The researchers thanked all participants for their outstanding contributions to the study.

Dependent Variable

Figure 1 provides a thorough summary of driving-related characteristics based on survey data. It categorizes drivers depending on their driving experience, with 6.4% having fewer than five years, 24.2% having 16–20 years, and 11.8% having more than 20 years. Almost one-third of those polled had never been in an accident, while 28.4% have been in one. A little smaller proportion (24.8%) has been in two or three accidents, while 11.3% has been in three or more. Surprisingly, 7.1% of drivers have been in three or more collisions. According to self-reported dangerous driving behavior, 41.7% of participants consider themselves low-risk drivers who prioritize safety, while 33.0% consider themselves high-risk drivers who take more major risks on the road. The remaining 25.3% are agnostic about their danger level. This data provides useful insights into driver behavior and risk management, emphasizing the need for focused initiatives to improve road safety while taking driving experience and self-perceived risk levels into account. Analyzing this data can help build more effective tactics to encourage safe driving behaviors and prevent road accidents.

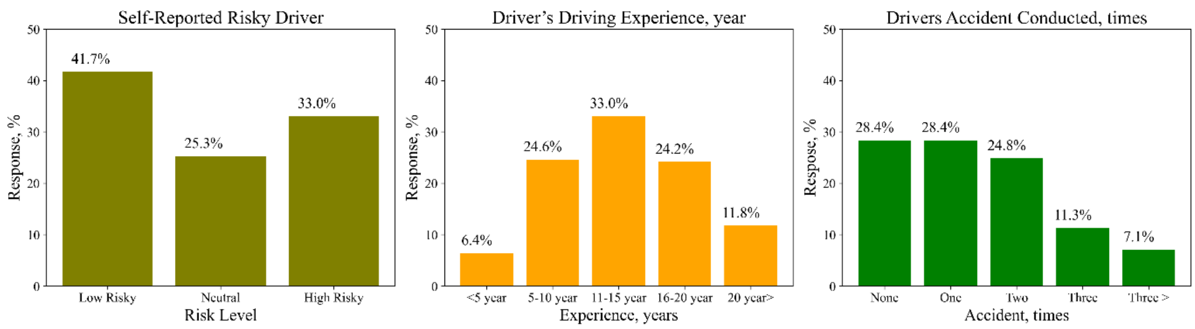

Figure 1. Descriptive Statistics of Dependent Variables.

Independent Variable

Table 1 provides the assign indicators for the 21 independent variables used in this analysis.

Table 1. Independent variable indicators.

Indicator	Question
x_1	Reducing speed before a sharp bend
x_2	Drive slowly or stop before approaching intersections
x_3	Turning on the headlights before sunset
x_4	Drive while fastening your seat belt
x_5	Driving/riding within your lane and not overtaking
x_6	Stop to allow pedestrians to cross at zebra crossing
x_7	Not driving after drinking alcohol
x_8	Pick passengers from no stoppage area

x_9	Drive even when I am sick
x_{10}	Driving in within the specified speed limit
x_{11}	Dissemination of traffic education
x_{12}	Do not use cell phone while driving
x_{13}	Avoid overtime
x_{14}	Ignoring traffic signals
x_{15}	Ignoring traffic signals when No traffic police were present
x_{16}	Was in hurry as reason for ignoring traffic signals
x_{17}	Follow all the traffic sign
x_{18}	Provision of on-street parking
x_{19}	Lack of streetlights as cause of accident
x_{20}	Bad road surface as a cause of accident
x_{21}	Pedestrians avoiding footbridges and underpasses, but unexpectedly crossing roads.

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

Figure 2 depicts the respondents' choices, which were "strongly disagree," "disagree," "neutral," "agree," and "strongly agree." Approximately 4.90% of respondents strongly disagreed, and 10.00% disagreed with slowing down before a tight turn. 17.30% strongly objected, and 72.90% disagreed with following speed limits. Slowing down or halting before approaching junctions was agreed upon by 42.40% of respondents, with 57.60% strongly agreeing. Turning on headlights before dark was agreed upon by 90.20% of respondents, with 8.00% strongly agreeing. Wearing seat belts when driving was agreed upon by 65.20% of respondents, with 26.60% strongly agreeing. Staying within defined lanes and not overtaking without need was agreed upon by 67.40% of respondents, with 17.70% strongly agreeing. 62.70% strongly opposed, and 37.30% severely disagreed with enabling pedestrians to walk safely at zebra crossings. 82.70% strongly agreed, whereas 17.30% agreed that pedestrians frequently avoided footbridges and underpasses, suddenly crossing roadways. 85.60% of respondents strongly agreed, and 11.30% agreed that driving after drinking should be avoided. Driving when unwell is dangerous, according to 84.00% of respondents, with 13.10% strongly agreeing. 34.40% of respondents agreed, and 42.80% strongly agreed, that passengers should not be picked up in no-stop zones. Promoting traffic education was supported by 79.60% of respondents, with 16.60% strongly supporting it. 35.70% strongly disagreed, while 54.50% disagreed, on the significance of avoiding using mobile phones while driving. 19.10% strongly disagreed and 67.80% disagreed on the need to avoid overtime to ensure road safety. 73.20% strongly agreed and 17.30% agreed on the need to respect traffic signals. When traffic cops were not present, however, 53.00% disagreed, showing a lack of adherence. Being in a hurry was cited as a common reason for disobeying traffic signals by 44.30% of respondents, with 42.80% strongly agreeing. 48.10% agreed, 24.20% definitely agreed, and 14.40% disagreed with obeying all traffic signs. 88.00% of respondents thought that on-street parking was necessary. 41.90% agreed and 36.10% strongly agreed that a lack of lamps played a role in accidents, whereas 17.70% disagreed. Bad road surfaces cause accidents, according to 83.80% of respondents, and 16.20% disagree.

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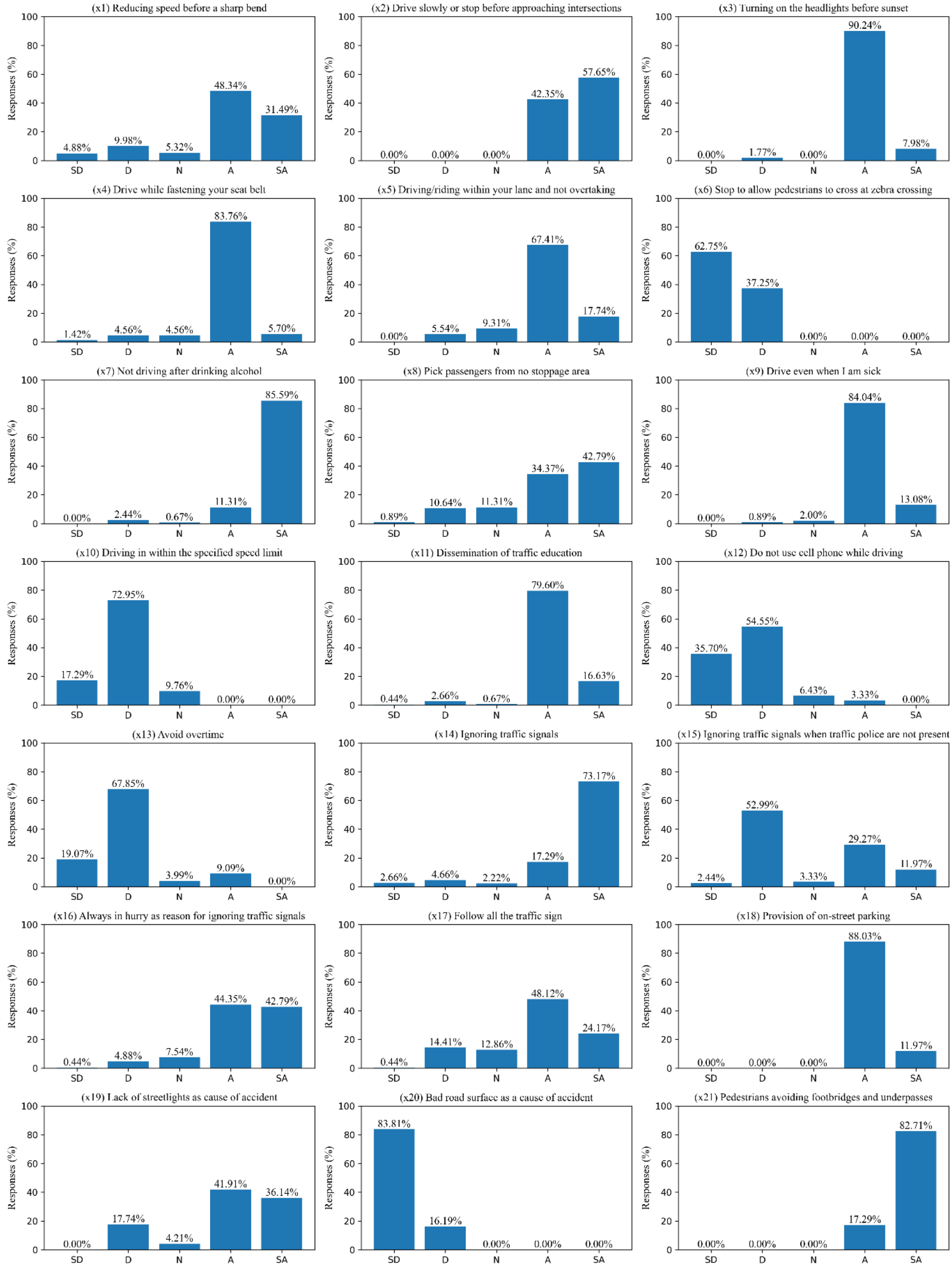

Figure 2. Descriptive Statistics of Independent Variables.

Statistical Model

Ordered logit model, also known as Proportional odds (PO) model, is usually defined in a latent (i.e., unobserved) variable framework. The equation is as follow:

$$Pr(y \leq c) = \frac{1}{(1 + exp(-(\beta' x \ + \gamma_c)))}$$

Where y is the dependent variable, which is an ordinal variable with c categories. In this study three models are developed by STATA software. Model 1 is developed by self-reported risky driver (low risk=1, moderate risk=2, and high risk=3). Model 2 is developed using drivers driving experience, years (<5=1, 5-10=2, 11-15=3, 16-20=4, 20>=5). Model 3 is developed utilizing accident conducted history, times (0=1, 1=2, 2=3, 3=4, 3+=5). x is a vector of independent variables. β' is a vector of parameters to be estimated. γ_c is a set of cut point parameters for each category of the dependent variable.

Correlation Matrix

A Pearson correlation matrix heat map is a visual depiction of a dataset's Pearson correlation coefficients, illustrating the linear link between independent variables (Figure 3). It is used to find strong correlations between variables, with darker cells suggesting stronger links. The Pearson correlation coefficient measures the linear relationship between two variables, with -1 representing perfect negative correlation, 0 representing no connection, and 1 representing perfect positive correlation. Positive connections are shown in red or orange, whereas negative connections are shown in blue or green. The heat map aids in detecting factors with high correlations.

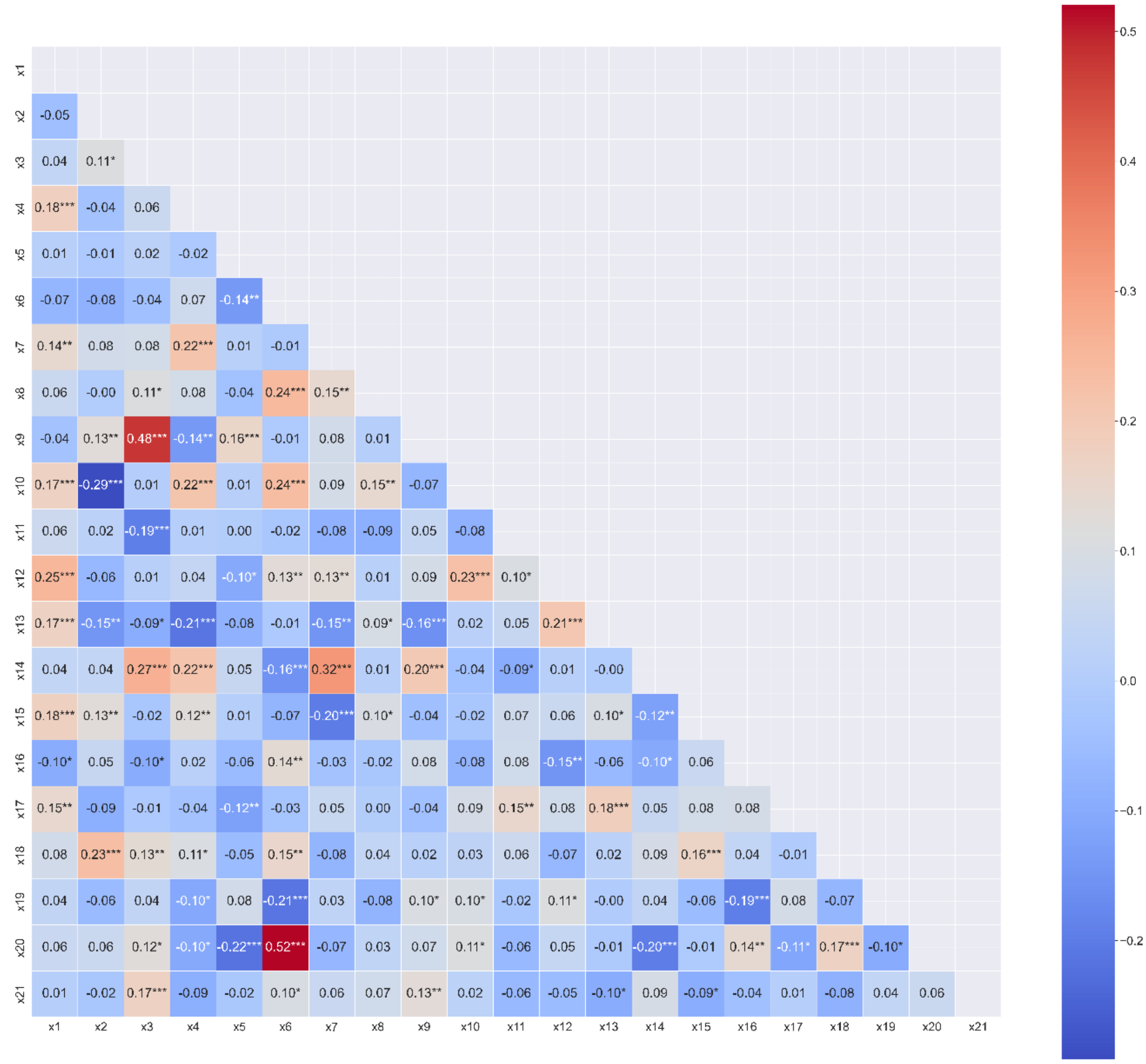

Figure 3. A two-tailed pearson correlation matrix heatmap.

3. RESULTS

Model Fitness

The goodness-of-fit measures for three ordered logit models are shown in Table 3. In Model 1, the negative log likelihood (-375.515) suggests a decent match, and the significant LR chi-square (221.580, p=0.000) shows a considerable improvement over the baseline model. The pseudo R^2 (0.228) demonstrates a 22.8% predictive power, which is backed by reduced AIC (797.030) and BIC (891.594) values, suggesting suitable model complexity. Similarly, in Model 2, which looks at driver experience, the negative log likelihood (-595.829) and substantial LR chi-square (145.330, p=0.000) indicate a good fit and an improvement over the baseline. The pseudo R^2 (0.109) explains 10.9% of the variance in the result, with lower AIC (1241.658) and BIC (1344.445) demonstrating appropriate model complexity. The negative log likelihood (-596.885) and significant LR chi-square (154.740, p=0.000) in Model 3 studying conducted accidents show a strong match and considerable model augmentation. The pseudo R^2 (0.115) explains 11.5% of the variance in the result, which is supported by reduced AIC (1243.769) and BIC (1346.556) values, highlighting the need of proper model complexity. These findings verify the models' applicability, providing useful insights into variable connections.

Coefficient Estimates

Three model estimation summaries are presented in Table 2, with details in the subsections that follow.

Table 2. Ordered logit model estimates.

Variables	Model 1: Self-Reported Risky Driver		Model 2: Driving Experience, years		Model 3: Accident Conducted, times	
	Coefficient	Odds Ratio	Coefficient	Odds Ratio	Coefficient	Odds Ratio
x_1	0.631***	1.880	0.348***	1.416	0.415***	1.514
x_2	1.216***	3.373	-0.001	0.999	0.939***	2.558
x_3	0.910*	2.484	1.008***	2.741	0.258	1.295
x_4	-0.659***	0.517	-0.324*	0.724	-0.206	0.814
x_5	0.808***	2.245	0.425**	1.530	0.631***	1.879
x_6	0.855**	2.351	1.298***	3.662	0.695**	2.004
x_7	1.395***	4.037	-0.139	0.870	-0.391*	0.677
x_8	-0.267*	0.766	-0.537***	0.584	-0.078	0.925
x_9	-0.680*	0.507	-0.791**	0.453	-0.124	0.883
x_{10}	-0.906***	0.404	-0.098	0.907	-0.598**	0.550
x_{11}	-0.667**	0.513	-0.081	0.922	-0.465**	0.628
x_{12}	-0.600***	0.549	0.414**	1.513	-0.288	0.750
x_{13}	-0.762***	0.467	-0.147	0.863	-0.495***	0.610
x_{14}	-0.772***	0.462	-0.126	0.881	-0.012	0.988
x_{15}	-0.228*	0.796	-0.311***	0.733	-0.320***	0.726
x_{16}	-0.052	0.950	0.424***	1.528	0.265*	1.304
x_{17}	0.288*	1.334	-0.157	0.854	0.025	1.025
x_{18}	-0.103	0.902	1.132***	3.103	0.451	1.569
x_{19}	0.038	1.038	-0.265**	0.768	0.152	1.164
x_{20}	-1.494***	0.224	-2.037***	0.130	-1.803***	0.165
x_{21}	0.060	1.061	-1.132***	0.322	-0.222	0.801
Model Fitness						
Log likelihood	-375.515		-595.829		-596.885	
LR chi2(21)	221.580		145.330		154.740	
Prob > chi2	0.000		0.000		0.000	
Pseudo R2	0.228		0.109		0.115	
AIC	797.030		1241.658		1243.769	
BIC	891.594		1344.445		1346.556	

Note: Significant label at * = 95%, ** = 99%, *** = 99.99%

Model 1: Self-Reported Risky Driver

Reduced speed before a sharp bend(x_1) is significant($\beta_1 = 0.651, OR = 1.880$). This means that for every one-unit increase in the predictor variable (x_1), the odds of engaging in the safe driving behavior (reducing speed before a sharp bend) increase by 1.88 times. Drive slowly or stop before approaching intersections (x_2) is significant ($\beta_2 = 1.216, OR = 3.37$). This means that for every one-unit increase in the predictor variable (x_2), the odds of engaging in the safe driving behavior (driving slowly or stopping before approaching intersections) increase by 3.37 times. Turning on the headlights before sunset (x_3) is significant ($\beta_3 = 0.910, OR = 2.484$). This means that for every one-unit increase in the predictor variable (x_3), the odds of engaging in the safe driving behavior (turning on the headlights before sunset) increase by 2.484 times. Drive while fastening your seat belt (x_4) is significant ($\beta_4 = -0.659, OR = 0.517$). This means that for every one-unit increase in the predictor variable (x_4), the odds of engaging in the safe driving behavior (drive while fastening your seat belt) decrease by 0.517 times. Driving/riding within your lane and not overtaking (x_5) is significant ($\beta_5 = 0.808, OR = 2.245$). This means that for every one-unit increase in the predictor variable (x_5), the odds of engaging in the safe driving behavior (driving/riding within your lane and not overtaking) increase by 2.245 times. Stop to allow pedestrians to cross at zebra crossing (x_6) is significant ($\beta_6 = 0.855, OR = 2.351$). This means that for every one-unit increase in the predictor variable (x_6), the odds of engaging in the safe driving behavior (stop to allow pedestrians to cross at zebra crossing) increase by 2.351 times. Not driving after drinking alcohol (x_7) is significant ($\beta_7 = 1.395, OR = 4.037$). This means that for every one-unit increase in the predictor variable (x_7), the odds of engaging in the safe driving behavior (not driving after drinking alcohol) increase by 4.037 times. Pick passengers from no stoppage area (x_8) is significant ($\beta_8 = -0.267, OR = 0.766$). This means that for every one-unit increase in the predictor variable (x_8), the odds of engaging in the safe driving behavior (Pick passengers from no stoppage area) decrease by 0.766 times. Drive even when I am sick (x_9) is significant ($\beta_9 = -0.680, OR = 0.507$). This means that for every one-unit increase in the predictor variable (x_9), the odds of engaging in the safe driving behavior (drive even when I am sick) decrease by 0.507 times. Driving in within the specified speed limit (x_{10}) is significant ($\beta_{10} = -0.906, OR = 0.404$). This means that for every one-unit increase in the predictor variable (x_{10}), the odds of engaging in the safe driving behavior (driving in within the specified speed limit) decrease by 0.404 times. Dissemination of traffic education (x_{11}) is significant ($\beta_{11} = -0.667, OR = 0.513$). This means that for every one-unit increase in the predictor variable (x_{11}), the odds of engaging in the safe driving behavior (dissemination of traffic education) decrease by 0.513 times. Do not use cell phone while driving (x_{12}) is significant ($\beta_{12} = -0.600, OR = 0.549$). This means that for every one-unit increase in the predictor variable (x_{12}), the odds of engaging in the safe driving behavior (pick passengers from no stoppage area) decrease by 0.549 times. Avoid overtime (x_{13}) is significant ($\beta_{13} = -0.762, OR = 0.467$). This means that for every one-unit increase in the predictor variable (x_{13}), the odds of engaging in the safe driving behavior (avoid overtime) decrease by 0.467 times. Ignoring traffic signals (x_{14}) is significant ($\beta_{14} = -0.772, OR = 0.462$). This means that for every one-unit increase in the predictor variable (x_{14}), the odds of engaging in the safe driving behavior (ignoring traffic signals) decrease by 0.462 times. Ignoring traffic signals when no traffic police are present (x_{15}) is significant ($\beta_{15} = -0.228, OR = 0.796$). This means that for every one-unit increase in the predictor variable (x_{15}), the odds of engaging in the safe driving behavior (ignoring traffic signals when no traffic police are present) decrease by 0.796 times. Always in hurry as reason for ignoring traffic signals (x_{16}) is insignificant ($\beta_{16} = -0.052, OR = 0.950$). This means that for every one-unit increase in the predictor variable (x_{16}), the odds of engaging in the safe driving behavior (always in hurry as reason for ignoring traffic signals) decrease by 0.950 times. Follow all the traffic sign (x_{17}) is significant ($\beta_{17} = 0.288, OR = 1.334$). This means that for every one-unit increase in the predictor variable (x_{17}), the odds of engaging in the safe driving behavior (follow all the traffic sign) increase by 1.334 times. Provision of on-street parking (x_{18}) is insignificant ($\beta_{18} = -0.103, OR = 0.902$). This means that for every one-unit increase in the predictor variable (x_{18}), the odds of engaging in the safe driving behavior (provision of on-street parking) decrease by 0.902 times. Lack of streetlights as cause of accident (x_{19}) is insignificant ($\beta_{19} = 0.038, OR = 1.038$). This means that for every one-unit increase in the predictor variable (x_{19}), the odds of engaging in the safe driving behavior (lack of streetlights as cause of accident) increase by 0.796 times. Bad road surface as a cause of accident (x_{20}) is significant ($\beta_{20} = -1.494, OR = 0.224$). This means that for every one-unit increase in the predictor variable (x_{20}), the odds of engaging in the safe driving behavior (bad road surface as a cause of accident) decrease by 0.224 times. Pedestrians avoiding footbridges and underpasses, but unexpectedly crossing roads (x_{21}) is insignificant ($\beta_{21} = 0.060, OR = 1.061$). This means that for every one-unit increase in the predictor variable (x_{21}), the odds of engaging in the safe driving behavior (pedestrians avoiding footbridges and underpasses, but unexpectedly crossing roads) increase by 1.061 times.

Model 2: Driving Experience

Reduced speed before a sharp bend (x_1) is significant ($\beta_1 = 0.348, OR = 1.416$). This means that for every one-unit increase in the predictor variable (x_1), the odds of engaging in the safe driving experience (reducing speed before a sharp bend) increase by 1.416 times. Drive slowly or stop before approaching intersections (x_2) is insignificant ($\beta_2 = -0.001, OR = 0.999$). This means that for every one-unit increase in the predictor variable (x_2), the odds of engaging in the safe driving experience (driving slowly or stopping before approaching intersections) decrease by 0.999 times. Turning on the headlights before sunset (x_3) is significant ($\beta_3 = 1.008, OR = 2.741$). This means that for every one-unit increase in the predictor variable (x_3), the odds of engaging in the safe driving experience (turning on the headlights before sunset) increase by 2.741 times. Drive while fastening your seat belt (x_4) is significant ($\beta_4 = -0.324, OR = 0.724$). This means that for every one-unit increase in the predictor variable (x_4), the odds of engaging in the safe driving experience (drive while fastening your seat belt) decrease by 0.724 times. Driving/riding within your lane and not overtaking (x_5) is significant ($\beta_5 = 0.425, OR = 1.530$). This means that for every one-unit increase in the predictor variable (x_5), the odds of engaging in the safe driving experience (driving/riding within your lane and not overtaking) increase by 1.530 times. Stop to allow pedestrians to cross at zebra crossing (x_6) is significant ($\beta_6 = 1.298, OR = 3.662$). This means that for every one-unit increase in the predictor variable (x_6), the odds of engaging in the safe driving experience (stop to allow pedestrians to cross at zebra crossing) increase by 3.662 times. Not driving after drinking alcohol (x_7) is insignificant ($\beta_7 = -0.139, OR = 0.870$). This means that for every one-unit increase in the predictor variable (x_7), the odds of engaging in the safe driving experience (not driving after drinking alcohol) decrease by 0.870 times. Pick passengers from no stoppage area (x_8) is significant ($\beta_8 = -0.537, OR = 0.584$). This means that for every one-unit increase in the predictor variable (x_8), the odds of engaging in the safe driving experience (Pick passengers from no stoppage area) decrease by 0.584 times. Drive even when I am sick (x_9) is significant ($\beta_9 = -0.791, OR = 0.453$). This means that for every one-unit increase in the predictor variable (x_9), the odds of engaging in the safe driving experience (drive even when I am sick) decrease by 0.453 times. Driving in within the specified speed limit (x_{10}) is insignificant ($\beta_{10} = -0.098, OR = 0.907$). This means that for every one-unit increase in the predictor variable (x_{10}), the odds of engaging in the safe driving experience (driving in within the specified speed limit) decrease by 0.907 times. Dissemination of traffic education (x_{11}) is insignificant ($\beta_{11} = -0.081, OR = 1.513$). This means that for every one-unit increase in the predictor variable (x_{11}), the odds of engaging in the safe driving experience (dissemination of traffic education) decrease by 1.513 times. Do not use cell phone while driving (x_{12}) is significant ($\beta_{12} = 0.414, OR = 0.549$). This means that for every one-unit increase in the predictor variable (x_{12}), the odds of engaging in the safe driving experience (pick passengers from no stoppage area) increase by 0.549 times. Avoid overtime (x_{13}) is insignificant ($\beta_{13} = -0.147, OR = 0.863$). This means that for every one-unit increase in the predictor variable (x_{13}), the odds of engaging in the safe driving experience (avoid overtime) decrease by 0.863 times. Ignoring traffic signals (x_{14}) is insignificant ($\beta_{14} = -0.126, OR = 0.881$). This means that for every one-unit increase in the predictor variable (x_{14}), the odds of engaging in the safe driving experience (ignoring traffic signals) decrease by 0.462 times. Ignoring traffic signals when no traffic police are present (x_{15}) is significant ($\beta_{15} = -0.311, OR = 0.733$). This means that for every one-unit increase in the predictor variable (x_{15}), the odds of engaging in the safe driving experience (ignoring traffic signals when no traffic police are present) decrease by 0.733 times. Always in hurry as reason for ignoring traffic signals (x_{16}) is significant ($\beta_{16} = 0.424, OR = 1.528$). This means that for every one-unit increase in the predictor variable (x_{16}), the odds of engaging in the safe driving experience (always in hurry as reason for ignoring traffic signals) increase by 1.528 times. Follow all the traffic sign (x_{17}) is insignificant ($\beta_{17} =$

$-0.157, OR = 0.854$). This means that for every one-unit increase in the predictor variable (x_{17}), the odds of engaging in the safe driving experience (follow all the traffic sign) decrease by 0.854 times. Provision of on-street parking (x_{18}) is significant ($\beta_{18} = 1.132, OR = 3.103$). This means that for every one-unit increase in the predictor variable (x_{18}), the odds of engaging in the safe driving experience (provision of on-street parking) increase by 3.103 times. Lack of streetlights as cause of accident (x_{19}) is significant ($\beta_{19} = -0.265, OR = 0.768$). This means that for every one-unit increase in the predictor variable (x_{19}), the odds of engaging in the safe driving experience (lack of streetlights as cause of accident) decrease by 0.768 times. Bad road surface as a cause of accident (x_{20}) is significant ($\beta_{20} = -2.037, OR = 0.130$). This means that for every one-unit increase in the predictor variable (x_{20}), the odds of engaging in the safe driving experience (bad road surface as a cause of accident) decrease by 0.130 times. Pedestrians avoiding footbridges and underpasses, but unexpectedly crossing roads (x_{21}) is significant ($\beta_{21} = -1.132, OR = 0.322$). This means that for every one-unit increase in the predictor variable (x_{21}), the odds of engaging in the safe driving experience (pedestrians avoiding footbridges and underpasses, but unexpectedly crossing roads) decrease by 0.322 times.

Model 3: Accident Conducted

Reduced speed before a sharp bend (x_1) is significant ($\beta_1 = 0.415, OR = 1.514$). This means that for every one-unit increase in the predictor variable (x_1), the odds of engaging in accident conducted (reducing speed before a sharp bend) increase by 1.514 times. Drive slowly or stop before approaching intersections (x_2) is significant ($\beta_2 = 0.939, OR = 2.558$). This means that for every one-unit increase in the predictor variable (x_2), the odds of engaging in accident conducted (driving slowly or stopping before approaching intersections) increase by 2.558 times. Turning on the headlights before sunset (x_3) is insignificant ($\beta_3 = 0.258, OR = 1.295$). This means that for every one-unit increase in the predictor variable (x_3), the odds of engaging in accident conducted (turning on the headlights before sunset) increase by 1.295 times. Drive while fastening your seat belt (x_4) is insignificant ($\beta_4 = -0.206, OR = 0.814$). This means that for every one-unit increase in the predictor variable (x_4), the odds of engaging in accident conducted (drive while fastening your seat belt) decrease by 0.814 times. Driving/riding within your lane and not overtaking (x_5) is significant ($\beta_5 = 0.631, OR = 1.879$). This means that for every one-unit increase in the predictor variable (x_5), the odds of engaging in accident conducted (driving/riding within your lane and not overtaking) increase by 1.879 times. Stop to allow pedestrians to cross at zebra crossing (x_6) is significant ($\beta_6 = 0.695, OR = 2.004$). This means that for every one-unit increase in the predictor variable (x_6), the odds of engaging in accident conducted (stop to allow pedestrians to cross at zebra crossing) increase by 2.004 times. Not driving after drinking alcohol (x_7) is significant ($\beta_7 = -0.391, OR = 0.677$). This means that for every one-unit increase in the predictor variable (x_7), the odds of engaging in accident conducted (not driving after drinking alcohol) decrease by 0.677 times. Pick passengers from no stoppage area (x_8) is insignificant ($\beta_8 = -0.078, OR = 0.925$). This means that for every one-unit increase in the predictor variable (x_8), the odds of engaging in accident conducted (Pick passengers from no stoppage area) decrease by 0.925 times. Drive even when I am sick (x_9) is insignificant ($\beta_9 = -0.124, OR = 0.883$). This means that for every one-unit increase in the predictor variable (x_9), the odds of engaging in accident conducted (drive even when I am sick) decrease by 0.883 times. Driving in within the specified speed limit (x_{10}) is significant ($\beta_{10} = -0.598, OR = 0.550$). This means that for every one-unit increase in the predictor variable (x_{10}), the odds of engaging in accident conducted (driving in within the specified speed limit) decrease by 0.550 times. Dissemination of traffic education (x_{11}) is significant ($\beta_{11} = -0.465, OR = 0.628$). This means that for every one-unit increase in the predictor variable (x_{11}), the odds of engaging in accident conducted (dissemination of traffic education) decrease by 0.628 times. Do not use cell phone while driving (x_{12}) is insignificant ($\beta_{12} = -0.288, OR = 0.750$). This means that for every one-unit increase in the predictor variable (x_{12}), the odds of engaging in accident conducted (pick passengers from no stoppage area) decrease by 0.750 times. Avoid overtime (x_{13}) is significant ($\beta_{13} = -0.495, OR = 0.610$). This means that for every one-unit increase in the predictor variable (x_{13}), the odds of engaging in accident conducted (avoid overtime) decrease by 0.610 times. Ignoring traffic signals (x_{14}) is insignificant ($\beta_{14} = -0.012, OR = 0.988$). This means that for every one-unit increase in the predictor variable (x_{14}), the odds of engaging in accident conducted (ignoring traffic signals) decrease by 0.988 times. Ignoring traffic signals when no traffic police are present (x_{15}) is significant ($\beta_{15} =$

$-0.320, OR = 0.726$). This means that for every one-unit increase in the predictor variable (x_{15}), the odds of engaging in accident conducted (ignoring traffic signals when no traffic police are present) decrease by 0.726 times. Always in hurry as reason for ignoring traffic signals (x_{16}) is significant ($\beta_{16} = 0.265, OR = 1.304$). This means that for every one-unit increase in the predictor variable (x_{16}), the odds of engaging in accident conducted (always in hurry as reason for ignoring traffic signals) increase by 1.304 times. Follow all the traffic sign (x_{17}) is insignificant ($\beta_{17} = 0.025, OR = 1.025$). This means that for every one-unit increase in the predictor variable (x_{17}), the odds of engaging in accident conducted (follow all the traffic sign) increase by 1.025 times. Provision of on-street parking (x_{18}) is insignificant ($\beta_{18} = 0.451, OR = 1.569$). This means that for every one-unit increase in the predictor variable (x_{18}), the odds of engaging in accident conducted (provision of on-street parking) increase by 1.569 times. Lack of streetlights as cause of accident (x_{19}) is insignificant ($\beta_{19} = 0.152, OR = 1.164$). This means that for every one-unit increase in the predictor variable (x_{19}), the odds of engaging in accident conducted (lack of streetlights as cause of accident) increase by 1.164 times. Bad road surface as a cause of accident (x_{20}) is significant ($\beta_{20} = -1.803, OR = 0.165$). This means that for every one-unit increase in the predictor variable (x_{20}), the odds of engaging in accident conducted (bad road surface as a cause of accident) decrease by 0.165 times. Pedestrians avoiding footbridges and underpasses, but unexpectedly crossing roads (x_{21}) is insignificant ($\beta_{21} = -0.222, OR = 0.801$). This means that for every one-unit increase in the predictor variable (x_{21}), the odds of engaging in accident conducted (pedestrians avoiding footbridges and underpasses, but unexpectedly crossing roads) decrease by 0.801 times.

4. DISCUSSION

The three ordered logit models offer fresh novel insights on how drivers perceive the factors that lead to traffic accidents. Model 1 investigates the significance of self-reported dangerous driving behaviors. Model 2 looks into driving experiences and how they affect traffic safety. Model 3 concentrates on accident-related components and their applicability as seen in real-world incidents.

Key findings in Model 1 include the significance of lowering speed before sharp bends, slowing down or stopping at intersections, using headlights before dusk, wearing seat belts, staying in lanes, stopping for pedestrians at zebra crossings, abstaining from driving under the influence, not driving when ill, adhering to posted speed limits, encouraging traffic education, discouraging the use of cell phones while driving, discouraging overtime, and observing all traffic signs. On the other hand, things like haste, the availability of on-street parking, a lack of illumination, and pedestrians ignoring designated underpasses and footbridges are seen to have little bearing on accident rates.

Key findings in Model 2 show that slowing down before sharp turns, using headlights before sunset, wearing seat belts, staying within lanes, stopping for pedestrians at zebra crossings, picking up passengers from authorized areas, driving while sick, and obeying traffic signals when no police are present are all important factors in promoting road safety. Furthermore, on-street parking, a lack of lamps, and poor road conditions all contribute significantly to accidents. Driving slowly or stopping before intersections, not drinking alcohol while driving, obeying speed limits, distributing traffic education, avoiding cell phone use, avoiding overtime, ignoring traffic signals, and pedestrians avoiding footbridges, on the other hand, are deemed insignificant in the context of accidents and risky driving behavior.

Key finding in Model 3 show that slowing speed before sharp turns, driving slowly or halting before junctions, maintaining within lanes, and stopping for pedestrians at zebra crossings are all important factors in avoiding accidents. Furthermore, not driving after consuming alcohol, spreading traffic education, avoiding overtime, following traffic signals when no police are present, and ignoring traffic signals because you are in a hurry are all important factors in accident avoidance. Turning on headlights before sunset, wearing seat belts, picking up passengers from unauthorized areas, driving while sick, driving within specified speed limits, not using cell phones, obeying all traffic signs, providing on-street parking, and a lack of streetlights, on the other hand, are found to be insignificant in causing accidents.

5. CONCLUSION

The purpose of this study was to investigate Dhaka-Khulna (N8) expressway drivers' perceptions of elements that contribute to road accidents. These factors are examined using three ordered logit models. Model 1 is concerned with self-reported dangerous driving habits, whereas Model 2 is concerned with driving experiences and their consequences for road safety. Model 3 investigates accident-related aspects and their use in actual accidents. Several general themes appear throughout the models, including the need to slow down before steep corners, emphasize pedestrian safety, and stick to prescribed speed restrictions.

Furthermore, the data emphasizes the importance of measures such as utilizing headlights, wearing seat belts, and not drinking alcohol while driving. Certain variables, on the other hand, like being in a hurry, using mobile phones, and disobeying traffic signals, repeatedly appear as minor causes of accidents. These findings give a thorough knowledge of the factors that influence road safety. These findings may be used by policymakers, educators, and law enforcement organizations to create targeted interventions and instructional programs aimed at encouraging safer driving practices and lowering the number of road accidents.

These three models' conclusions have significant implications for road safety education and enforcement. We can create more effective interventions to encourage safe driving habits if we understand drivers' opinions of the elements that lead to accidents. Educational efforts, for example, might focus on the dangers of certain unsafe driving habits, such as speeding and failing to stop at junctions. Similarly, enforcement measures should target these habits as well as other variables that contribute to accidents, such as speeding in school zones and failing to yield to pedestrians. We can help reduce the number of accidents and save lives by taking a focused approach to road safety.

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