

MOTORISTS' AND PEDESTRIANS' UNDERSTANDING OF TRAFFIC SIGNALS AND ROAD MARKINGS IN DHAKA CITY

Syed Ahnaf Morshed*¹, Ahadul Islam² and Tahmina Rahman Chowdhury³

¹ Lecturer, Stamford University of Bangladesh, Bangladesh, e-mail: ahnafmorshed@stamforduniversity.edu.bd

² Captain, Bangladesh Army, Bangladesh, e-mail: cen.ahadul@stamforduniversity.edu.bd

³ Assistant Professor, Stamford University of Bangladesh, Bangladesh, e-mail: ctahmina@gmail.com

ABSTRACT

Motorists' and Pedestrians' understanding of some selected traffic markings and signals were assessed through a questionnaire survey. The survey was conducted among 180 drivers and pedestrians of Dhaka city. Twelve (12) road markings and three (3) traffic signals were evaluated. The information collected during the questionnaire survey regarding the demographic characteristics of the motorists' and pedestrians' facilitated the understanding of the type of behaviour of the road users. The results indicated that the drivers had a moderate level of comprehension of the meaning of the road markings and signals. The overall understanding level, measured in terms of percentage of correct responses, was only about 61%. Exactly seven road markings and signals were understood by more than 80 percent of the respondents. The percentage of drivers who correctly identified the road markings and signals were 63% and the percentage of pedestrians who correctly identified the road markings and signals were 61% respectively. The study results indicate that lack of knowledge exists among the drivers and the pedestrians about the road markings and signals.

Keywords: road markings, traffic signals, questionnaire survey, motorist, pedestrian, Dhaka city

1. INTRODUCTION

Clear and effective traffic signals and marking are essential for the efficient operation of the road network, for the enforcement of traffic regulations and for road safety. Traffic control devices (TCDs) - signals & marking are a vital part of the highway system. Traffic signals are the oldest and most frequently used traffic control devices currently in use. Road markings are used as a means of controlling and guiding traffic. They are highly important on urban roads and intersections as they promote road safety and bring out smooth and harmonious flow of traffic along guided paths of travel. They provide a means of communicating important information about the roadway to the driver. Traffic signs, signals & marking utilize colour, shape, symbols or words to convey information. However, the traffic signals & marking cannot effectively serve their intended purposes if drivers do not understand the information concerning safe driving behaviour that is encoded in the signs (Stokes et al.1995). Traffic control device have been a topic of considerable interest to researchers during the past few decades.

Traffic control devices covered a wide range of aspects related to engineering, traffic safety, educational, and human physical capabilities. Studies on drivers' and pedestrians' conception of traffic signals & marking from psychological and demographical point of view are still scarce. While a lot of research effort was undertaken in the western world, especially in the United States, the literature review revealed that very few studies to assess the driver's and the pedestrian's understanding of traffic control devices in Bangladesh has been reported to date. There is a general public perception that the city drivers and pedestrians do not have a satisfactory level of understanding of traffic signals & marking and often this is thought to be a major cause of road accidents. Consequently, this study was undertaken to assess the drivers' and pedestrians' understanding of certain traffic markings and signals in Dhaka, the capital city of Bangladesh. The survey location is limited from Mouchak to Palashi intersection (see Figure 1).

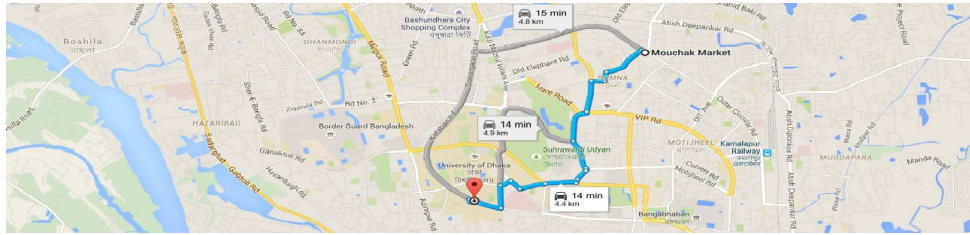


Figure 1: Road Map (Survey Area)

2. METHODOLOGY

Driver's understandings of traffic signals and road markings were evaluated by conducting a survey among the drivers in the Dhaka city. In this study, "understanding" was assessed in terms of how well drivers correctly identify the safety-related messages encoded in certain traffic signals and road markings. A multiple-choice type questionnaire for each traffic control device to be evaluated was prepared. In addition to the multiple-choice type questionnaire, the survey form contained a brief introduction about the purpose of the study, and some specific queries regarding the respondents' demographic and driving characteristics. Statistical analyses were also performed to determine if there are any causal relationships between the respondents' understanding of traffic signals and road markings and their demographic and driving characteristics.

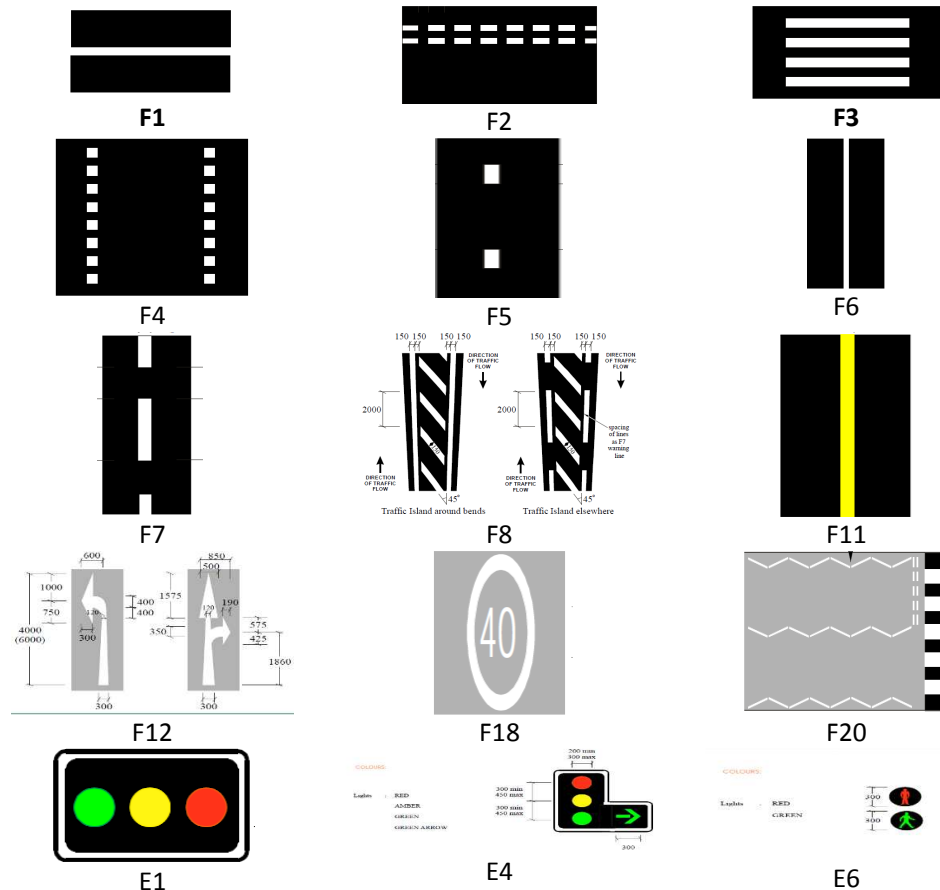


Figure 2: Twelve road markings and three traffic signals evaluated (shown with the symbol designation by Roads and Highways Department, Govt. of Bangladesh)

2.1 Content of Survey Form

The survey instrument had two parts- the first part contained images of the road markings and signals evaluated and the corresponding multiple-choice questions related to each sign. A total of 15 markings and signals were evaluated. The markings and signals were selected based on a) driver's familiarity of the markings and signals, and b) its importance. Of these 15 traffic markings and signals evaluated, 12 were road markings, 3 were traffic signals (see Figure 2). The second part of the survey form had 9 questions regarding the respondents' demographic and driving characteristics. As noted earlier, the survey questions were designed to test understanding of specific aspects of the safety related messages encoded in certain signs. The survey was conducted among both professional and non-professional drivers along with pedestrians. Considering the time and opportunities to interview the drivers and the pedestrians, a sample of 100 drivers and 80 pedestrians were settled to be sufficient for meaningful statistical analyses. In the case of professional drivers, the survey was administered in public places where drivers would have time available to complete the survey. The location selected for conducting the survey is from Mouchak to Palashi. Survey forms were distributed to the educated non-professional drivers and pedestrians to fill on their own. The completed survey forms were then collected from them later.

2.2 Characteristics of Survey Respondents

Table 1 summarizes the demographic characteristics of the 180 survey respondents. Out of these 180 respondents, 141 were male and only 39 of them were female among which 4 were female drivers and the rest 35 of them were pedestrians. The age distribution showed that the survey respondents were mostly young. 60% of the respondents were below the age 35 years and 90% of the respondents were below the age 45 years. 38% of the respondents were in the age range of 25 to 34 years. Almost 74% of the drivers and 26% of the pedestrians did not complete their high school (10th grade or less), and only 2% of the drivers and 40% of the pedestrians had bachelor's or higher educational degrees (Table 1).

Table 1: Demographic characteristics of the survey respondents

Characteristics		Sample Number		Percentage (%)		Total (%)
		Driver	Pedestrian	Driver	Pedestrian	
Gender	Male	96	41	96	51	100
	Female	4	39	4	49	
Age	Below 18	00	01	00	01	100
	18 – 24	08	25	08	31	
	25 – 34	46	23	46	29	
	35 – 44	26	28	26	35	
	45 & above	20	03	20	04	
Education	Primary	74	21	74	26	100
	SSC	22	08	22	10	
	HSC	02	19	02	24	
	Honors	00	23	00	29	
	Masters	02	09	02	11	

Table 2 presents the driving characteristics of the survey respondents. The results show that 50% (90 out of 180) of the respondents were professional drivers. Approximately 4% of the respondents were taxi drivers, followed by 34% of bus drivers and 6% of truck drivers. Table 2 also shows that 23% of the respondents had driving experience of over 10 years and more than 31% of the respondents had driving experience of more than 6 years. In general, the respondents also mentioned that they did not have any driving education (70%). Based on these demographic and driving characteristics analyses of the respondents it would be reasonable to assume that the results of the understanding of road markings and traffic signals presented in the following section are applicable to male professional drivers of ages between 25 and 44 years. Efforts were made to select samples which could represent a wide range of demographic and driving characteristics. However, as mentioned earlier, proportion of driving population as compared to the total population of the city is very low. As a result, increasing the sample size would take a considerable amount of time and effort, and eventually was discarded.

3. RESULTS OF DRIVER UNDERSTANDING OF ROAD MARKINGS AND TRAFFIC SIGNALS:

The survey was administered to a total of 100 drivers and 80 pedestrians comprised in the area from Mouchak to Palashi in Dhaka, the capital city of Bangladesh. Twelve types of road markings and three types of traffic signals- were tested. The motorists' and pedestrians' understanding of these types of road markings and traffic signals was evaluated based on the average response rates- correct, incorrect, and not sure. The results of the evaluation are summarized in this section.

Table 2: Driving characteristics of the survey respondents

Characteristics		Sample Number		Percentage (%)		Total (%)
		Driver	Pedestrian	Driver	Pedestrian	
Driver for Job	Yes	90	00	90		100
	No	10	80	10	N/A	
Driving Days Per Week	One	00		00	N/A	100
	Two	02		02	N/A	
	Three	36		36	N/A	
	Four	08		08	N/A	
	Five	32		32	N/A	
	Six	00		00	N/A	
	Seven	22		22	N/A	
License Type	Professional	54		54	N/A	100
	Non-Professional	10		10	N/A	
	Motorcycle	36		36	N/A	
Years Licensed	No License	05		05	N/A	100
	Less than 1	08		08	N/A	
	1-5	56		56	N/A	
	6-10	8		08	N/A	
Vehicles Type	More than 10	23		23	N/A	100
	Passenger Car	04		04	N/A	
	Private Car, SUV	24		24	N/A	
	Bus, Mini Van	34		34	N/A	
	Medium Truck	06		06	N/A	
	Large Truck	00		00	N/A	
	Three Wheeler	04		04	N/A	
Motor Cycle	28		28	N/A		
Driving Education	Yes	70		70	N/A	100
No	30		30	N/A		

Among the twelve road markings used for the survey the most correct identification done by the drivers were of the "Special Speed Limit" marking. 94% of the driver recognized this traffic marking successfully. On the other hand 91% pedestrians recognized the marking. 100% pedestrians were successful to recognize the "Barrier Line" marking successfully whereas only 76% drivers guessed it correctly. Only 2% of the drivers assumed the "Zigzag Line" correctly and only 3% passersby guessed the same marking correctly. More than 50% drivers were able to identify the "Pedestrian Crossing", "Lane Line", "No Parking", "Warning Line", "Traffic Lane Arrows" markings whereas the majority of them failed to identify the "Traffic Island", "Signal Controlled Pedestrian Crossing", " Stop Line at Stop Sign" and "Give Way Line" traffic markings. In terms of the pedestrians understanding of the traffic markings, more than 50% of them were able to recognize only 6 traffic markings.

3.1 Traffic Signals

The survey indicates a formidable statistics in case of identifying and understanding of the traffic signals by the motorists and the pedestrians. 100% of the respondents were able to guess the traffic signals correctly except only 9 pedestrians (all women). These 9 female pedestrians failed to identify the "Supplementary Green Arrow Signal" traffic signal.

Table 3 and Table 4 show Drivers' and Pedestrians' Understanding of road markings and traffic signals.

Table 3: Drivers' and Pedestrians' understanding (percent correct) of road markings




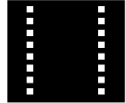


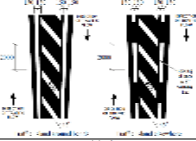


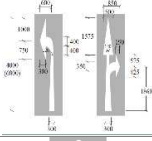

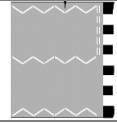

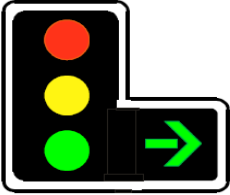
Traffic Markings and Signal	Meaning of Traffic Markings and Signal	Sample Number		Percentage (%)		Total (%)
		Driver	Pedestrian	Driver	Pedestrian	
	Stop-line at stop sign or traffic signals	100	80	38	86	59
	Give Way Line	100	80	34	11	24
	Pedestrian Crossing	100	80	74	100	86
	Signal Controlled Pedestrian Crossing	100	80	22	29	25
	Lane Line	100	80	82	100	90
	Barrier Line	100	80	76	100	87
	Traffic Island	100	80	14	19	16
	Warning Line	100	80	58	21	42
	No Parking	100	80	66	10	41
	Traffic Lane Arrows	100	80	88	55	73
	Special Speed Limit	100	80	94	91	93
	Zigzag Line	100	80	2	1	3

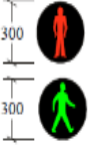
Table 4: Drivers' and Pedestrians' understanding (percent correct) of traffic signals

Traffic Signal	Meaning of Traffic Markings and Signal	Sample Number		Percentage (%)		Total (%)
		Driver	Pedestrian	Driver	Pedestrian	
	Standard Signal Arrangement	100	80	100	80	100
	Supplementary Green Arrow	100	80	100	71	95
	Pedestrian Signal	100	80	100	80	100

COLOURS:

Lights : RED

GREEN



4. ASSOCIATION BETWEEN DEMOGRAPHIC AND DRIVING CHARACTERISTICS AND SURVEY RESPONSES

Drivers' responses were further analysed to see if their demographic and driving characteristics (Table 1 and Table 2) had any effect on their responses. Only age and academic education of the respondents had influenced the responses. The respondents in age groups 35-44 years scored (percentage of correct answers) higher compared to the age groups of 25-34 and 18-24 years. Similarly, respondents with at least bachelor's degree scored higher than the respondents who completed the high school (S.S.C./H.S.C.) as well as who did not complete the high school (10th grade or below). The same trait is observed in the pedestrians'.

5. LIMITATIONS OF THE STUDY RESULTS

The use of multiple-choice format places some restrictions on the survey results. Multiple-choice questions eliminate a respondent's freedom to express their own explanation of the meaning of a traffic sign (Stokes et al., 1995). As a result, the responses are influenced by the possible choices. In addition the accuracy of the result would have enhanced if the number of respondents of the survey was more than 180. Another limitation inherent in the survey method is the format used to display the various traffic signs and road markings under investigation. While color images of the road markings were used, the images were not presented in-context (i.e., they were not shown as they would be encountered in the driving environment). Therefore, the respondents could not use "environmental information" as an aid in interpreting the traffic signs displayed on the questionnaires. The method used to collect the sample places certain limitations on the study results. The basic approach used to collect the sample was to administer the survey only at sites where it was anticipated that the number of potential respondents would be large enough to produce a sufficient return in a reasonable amount of

time. While a reasonable effort was made to insure the representativeness of the sample, the sample was not collected in a truly random manner.

6. CONCLUSION

The main objective of this study was to assess the driver's understanding of some selected road markings and traffic signals. A total of 15 road markings and traffic signals were evaluated. The understanding was assessed in terms of how well drivers and pedestrians correctly identified the safety-related messages encoded in certain road markings and traffic signals. A questionnaire-type survey instrument was developed for use in this study. The survey form had two parts- multiple-choice responses for each of the 15 road markings and traffic signals evaluated and respondents' background information. The results indicated that the drivers and pedestrians had a moderate level of comprehension of the meaning of the road markings and traffic signals. The overall understanding level, measured in terms of percentage of correct responses, was only about 61%. Exactly seven road markings and traffic signals - were understood by more than 80 percent of the respondents. The percentage of drivers who correctly identified the traffic markings and signals were 63% and the percentage of pedestrians who correctly identified the traffic markings and signals were 61% respectively. The study results indicate that lack of knowledge exists among the drivers and the pedestrians about the traffic markings and signals. Based on analyses of demographic and driving characteristics of the respondents, it would be reasonable to assume that the results of the understanding of road markings and traffic signals presented here are applicable to male professional drivers of ages between 25 and 44 years.

Statistical analyses to test the degree of association of demographic and driving characteristics of the respondents with their responses were performed. The results indicated that only respondents' age and academic qualification had some meaningful effects on their responses. The study results indicated that efforts are needed to educate the drivers on the proper meaning and response to traffic signs. During the study, it was found that driver education and use of a driver's handbook can be the primary ways to teach the meaning of traffic signs. The government organization that has the responsibility for drivers' licensing should be adequately supported; because traffic signs fulfill other driving navigational needs. Other educational programs could include outreach materials such as brochures and videos, campaign or through public media like radio and television or informational Internet web sites. These recommendations should be implemented or pursued through the collaboration of traffic-safety officials, law-enforcement agencies, and transportation professionals.

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