

# Predicting the Orientation of Vehicle Drivers towards the Traffic and Speed Enforcement Surveillance System



Abdullah Almurayh<sup>1,\*</sup> , Abdelrahman Bedaiwy<sup>2</sup>  and Ahmed Elsharkasy<sup>3</sup> 

<sup>1</sup>Department of Education Technologies, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia

<sup>2</sup>Department of Administrative Sciences, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia

<sup>3</sup>Department of Psychology, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia

## Abstract:

**Background:** A traffic and speed enforcement system in the Kingdom of Saudi Arabia known as Saher employs traffic monitoring and speed enforcement around the clock using surveillance cameras. Vehicle drivers' attitudes towards this system vary due to several variables.

**Objective:** The study investigates the impact on the prediction of male vehicle drivers' orientation towards the application of the Saher system and whether there is a difference in the vehicle drivers' orientation toward the system over time (five years later).

**Methods:** The study sample consisted of 761 participants from Imam Abdulrahman bin Faisal University. The quantitative approach was a questionnaire titled "Vehicle Drivers' Orientation towards the Application of the Traffic and Speed Enforcement Surveillance System (Saher)", which was applied in 2016 and 2021.

**Results:** The psychometric characteristics of the study tool were ascertained, the data was quantitatively analyzed, and the results showed that vehicle drivers' orientations toward the Saher system were positive, the nationality and number and type of violation contribute to predicting their orientation toward the system at varying rates, and the orientation of vehicle drivers toward the system improved five years later.

**Conclusion:** The study recommends conducting a study with wider societal segments, including women who started driving in Saudi Arabia in 2018, while also focusing on the qualitative aspect of the analysis of the study findings, taking testimonials of the groups that have been involved in accidents and families of groups who have suffered from deaths in order to determine their orientations towards the system.

**Keywords:** Speed enforcement, Traffic surveillance, Orientation, Vehicle drivers, Saher, Surveillance cameras.

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\*Address correspondence to this author at the Department of Education Technologies, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia; E-mail: [asalmurayh@iau.edu.sa](mailto:asalmurayh@iau.edu.sa)

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## 1. INTRODUCTION

The augmentation of traffic accidents in Saudi Arabia remains a long-standing problem. Reports from the World Health Organization on road safety indicate that the annual mortality rate (per 100,000 people) in Saudi Arabia

has risen from 17.4 to 27.4, which represents an alarming situation, and that most serious accidents occur outside city centers all along the urban highways [1]. Most car accidents are caused by an increase in speeding, and almost half of the deceased in these accidents are under the age of 30, which accentuates the seriousness of traffic

accidents as targeting young people. The annual cost of accidents exceeds \$5.6 billion; the rate of production loss due to car accidents the rate 4.7% of Gross National Products (GNP), while in most countries, it does not exceed 1.7%. Since the Kingdom of Saudi Arabia wishes to maintain the lives and property of its citizens, the government allocated \$533 million to launch the traffic and speeding enforcement surveillance system, named the Saher system, to limit traffic speeding violations and reduce accident rates and the number of deaths [2].

The growth of car accidents and the rise in the number of deaths are rising; thus, further research is necessary to analyze and explain the problem. At the same time, technical means, procedures, and strict traffic laws are needed to deter reckless vehicle drivers and refine their driving behavior. The Saher system addresses the problem by using an electronic computer system to control and manage traffic throughout the main cities of Saudi Arabia, with the aim of reducing the mortality rate and improving road safety. The system uses advanced digital camera network technology connected to the National Information Center referring to the Ministry of Interior [3]. The Saher system was initiated in 2010 and targeted the capital, Riyadh; then, it was gradually circulated among the rest of the Saudi Arabian districts, as shown in Fig. (1). Through coordination with the Saudi Ministry of Interior, the system began to monitor excess speeding or passing red-light violations since most of the death cases were due to speeding [2].



**Fig. (1).** A picture of a road speed enforcement device (saher) and its well-known logo in Saudi Arabia.

Vehicle drivers' orientation varied between acceptance and rejection of the system; thus, this study aims to determine drivers' orientation towards the system and whether it changed over time. It also aims to identify the factors that could predict the orientation of vehicle drivers towards the system; thus, the study's goals focus on identifying the differences in the dimensions of orientation towards the Saher system according to research clarifying variables, namely age, educational level, nationality, number of violations, daily driving hours, type of violation, and the amount of time Saher has existed within a given location's traffic system.

Accordingly, the research problem addressed in this study may be formulated with the following questions: What are the orientations of vehicle drivers towards the Saher system? What is the predictability of vehicle drivers' orientation towards the system based on age, educational level, nationality, number of violations, daily driving hours, and type of violation? How different are the orientations of vehicle drivers towards the traffic and speed enforcement surveillance system over time (*e.g.*, five years later)?

## 2. BACKGROUND

The Saher system is a well-developed electronic system for monitoring and recording speeding and trespassing violations on public roads in Saudi Arabia. The system relies on a network of cameras distributed along the Kingdom's roads in order to improve traffic safety, implement traffic systems accurately and continuously, implement traffic procedures accurately and smoothly, provide a safe traffic environment, and upgrade the efficiency of the Kingdom's road network [3].

The Ministry of Interior of Saudi Arabia has been keen to achieve traffic safety for citizens and residents through practices aimed at achieving traffic security and safety for community members through the development of modern monitoring systems for vehicle drivers. The most significant of these systems and technologies is the Saher system. This system controls and manages traffic automatically using a computer system through the digital camera network that is connected to the information center, which in turn verifies the violations automatically and then requests the vehicle owner's information from a database, followed by the issuance of speeding and red-light violations. The goal of this system is to improve traffic safety levels, implement traffic systems accurately and continuously, raise the level of safety, and improve the efficiency of the road network. The Saher system covers the main cities in Saudi Arabia through integrated subsystems that include live traffic monitoring, traffic management, quick traffic case processing, live monitoring of traffic cases and accidents, and capturing violations and notifying the violator as soon as possible [3]. The Saher system has been the subject of research and assessment since the beginning of its operationalization within the traffic systems because of its usefulness and effects. One study [4] concluded that accident and death rates declined after the application of Saher, while another study [2] indicated that the number of transport accidents in Saudi Arabia decreased after the application of the system compared to the number prior to its application. The number of injury accidents in Saudi Arabia did not decrease after the application of Saher.

A study by Al-Shammari and Ling [5] aimed to identify human behavior in interacting with Saudi Arabia's traffic surveillance system, using a sample size of 251 Saudi nationals to verify the effectiveness of the traffic surveillance system. The results showed that important factors may not be affected by the new system and that Saher would not change people's driving behavior or increase safety on the road. A study by Al-Mutir [6]

concluded that despite the introduction of modern traffic control techniques in the traffic and speed enforcement surveillance system in Riyadh, they have a slight impact on the traffic surveillance system in reducing the number of traffic violations, the number of traffic accidents or the number of injuries and deaths, and indicated red traffic sign passing violations at some intersections that do not have traffic CCTV in north and east of Riyadh. Whereas the result of this exclusiveness shows that the percentage of traffic light violations in eastern Riyadh is higher than that in northern Riyadh, and the study provided some recommendations, of which the most notable is the review of the traffic control strategy, especially in the Kingdom's main cities. In the same context, studies by Li *et al.* [7] and Wali *et al.* [8] concluded the feasibility of speeding cameras as surveillance devices to be considered one of the most effective socio-economic policies to save money and lives.

A study conducted by Alasseri *et al.* [9] compared facial injuries associated with RTA before and after introducing the Saher system and showed that the severity and number of injuries decreased after its introduction. Jamal *et al.* [1] provided an analysis of statistics on incidents in the Eastern Province of Saudi Arabia from 2009 to 2016; the results showed that 2012 witnessed the highest number of accidents and that the Al-Ahsa region experienced a much higher rate of total incidents. They concluded that the provincial mortality rate was 25.6%, and these figures are much higher compared to the developed countries and neighboring Gulf countries. Several appropriate strategies have been proposed to prevent and mitigate accidents, including the implementation of a traffic control system. A study by Kaygisiz and Sümer [10] aimed to verify the effectiveness of the application of fixed speeding cameras for traffic accidents in Ankara, Türkiye, compared to the pre-camera period between 2009-2011, and the results revealed the effectiveness of the installation of cameras in decreasing rates of injuries and deaths.

A study by Larue and Naweed [11] indicated the feasibility of surveillance cameras in reducing accidents and controlling their negative effects, while a study by Gani *et al.* [12] examined the vehicle drivers' surveillance system developed on Android smartphones and discovered that it has limited effectiveness. A study by Li. *et al.* [7] reviewed the impact of the application of traffic safety surveillance cameras in controlling the speed of traffic, the speed of the car, and the change in its speed. A study by Ilgaz and Saltan [13, 14] conducted on a sample of 729 drivers who regularly enter and exit the university campus indicated that 52.8% of the participants believe that the speed limits imposed by the application of average speed are low. Al-Wathinani's study [15] indicated that behavior among drivers in Saudi Arabia is generally identical to that in other cultures and countries in that men and young people take the greatest risk while driving. It recommended the development and implementation of preventive strategies in Saudi Arabia. A study by Adi *et al.* [16] concluded the feasibility of using a machine learning

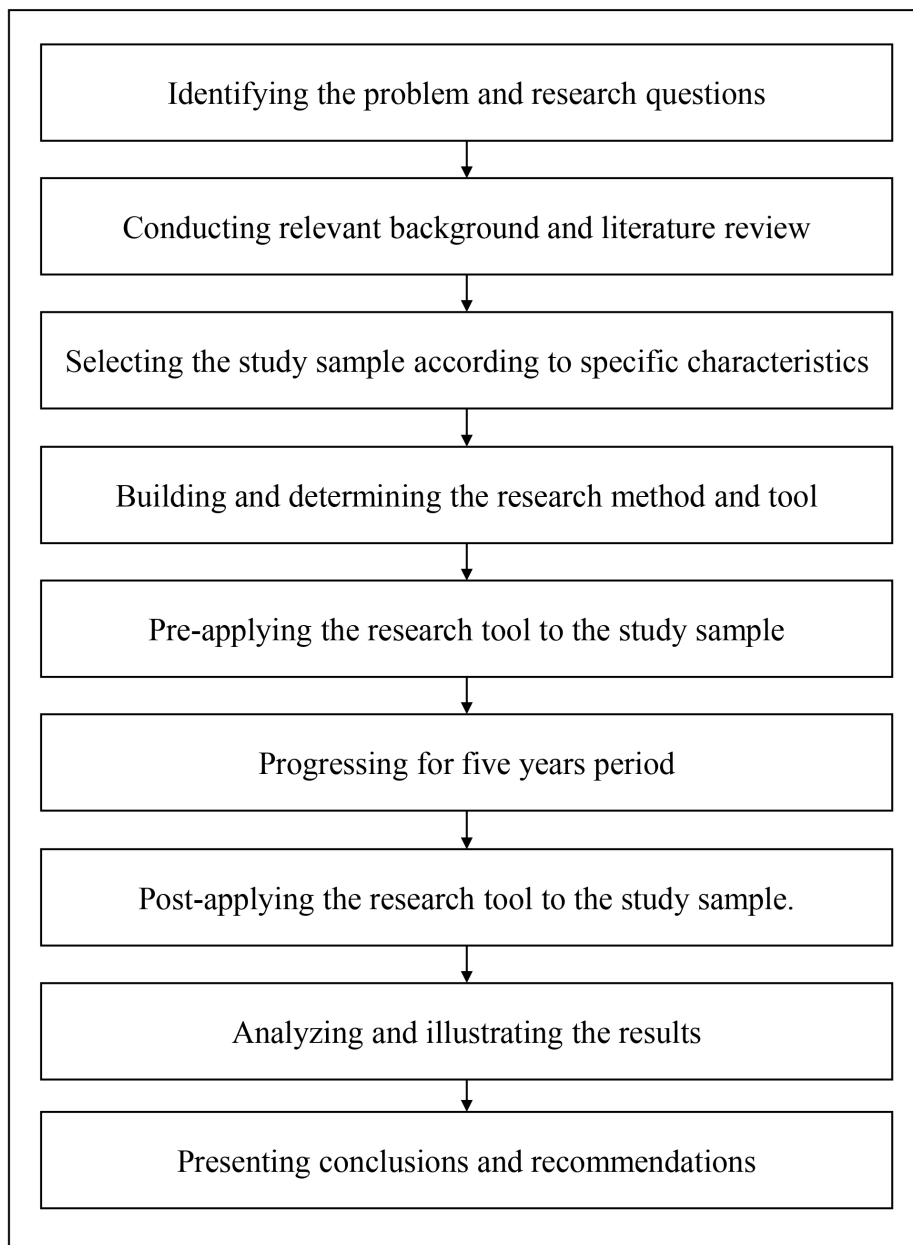
method to determine types of car traffic violations using image processing techniques to support the application of electronic traffic law. Kitali *et al.* [17] sought to reduce accidents associated with intersections, which accounted for 40% of all accidents, in addition to their resulting risks by assessing the effectiveness of vehicle safety in the city of Miami, USA. Their results indicated a significant reduction in all types of accidents after the installation of the vehicle security system. Therefore, effective traffic safety management through modern traffic technologies such as the Saher system reduces accidents and increases the human sense of security and stability. This is highlighted in a study by Al-Din [18], which aimed to identify the impact of traffic safety management in achieving human safety in the Al-Aflaj traffic division. Despite admitting that the goals of the traffic and speed enforcement surveillance system are all positive, the orientation of the drivers towards it varies between acceptance and rejection of its impact; some consider it a positive technique, while others consider it negative. The psychosocial orientation of community members towards the traffic and speed enforcement surveillance system is one of the most important outcomes of the process of social upbringing, practices, and life visions while being, at the same time, one of the most important motives of behavior that play an essential role in its control and direction.

Orientations are defined as the individual's response to a particular object, event, or case, either by acceptance or rejection, because of a particular experience with this event or case [19]. Gibson and Jane [20] defined orientation as a state of mental preparedness, positive or negative, acquired and organized through experience and practice, and that affects the individual's responses to people, things, and situations. Andersen [21] defined it as what an individual expresses in consistent responses, with a degree of continuity and consistency. Orientations represent a range of ideas, feelings, perceptions, and beliefs about the traffic and speed enforcement surveillance system, and they guide the individual's behavior and determine his or her attitude. Orientations are the result of a positive or negative generalization of the individual responses, and these responses are controlled primarily by the force of different motivations [22]. Alport indicated that orientations represent a state of mental and nervous preparedness originating from a person's prior experience, which dynamically affects responses to all subjects and situations related to it [23].

Drivers' orientations toward the Saher system can indicate how they feel about such surveillance and the degree to which they accept or reject it, as well as their perceptions of various aspects of surveillance systems. A study by Al-Balawni and Jamedah [24] aimed to identify the impact of automated control on the driver's psychological behavior and reduce accidents and traffic congestion. Results showed that 76% of the study sample reported automated control to have a positive impact on the driver's psychology and behavior while driving, while 82.4% of the sample considered automated control as

fairer and more objective than human control, 80.8% considered cameras as a way of forcing the driver to abide by the rules of traffic, 76% indicated that they feel disturbed when approaching the camera location, 69.3% replied that they felt angry or regretful if captured by a camera, 81.1% replied that they reduce their speeding when approaching the camera location, and 77.3% avoid the streets where cameras are installed. The results also showed that 75.4% consider that automated control has a positive impact on the reduction of accidents and traffic congestion, and 83.9% think red traffic sign passing

violations and speeding violations are among the most significant causes of accidents. This emphasizes that drivers have become convinced that the use of cameras to control such violations is a successful and effective means for reducing accidents and congestion. The results of the study also show that 77.6% of the sample prefer automated control over human control, and they also agreed to increase the number of cameras and spread them in governorates and on external roads, while 67.5% of the sample was found to be familiar with the concepts of automated control.



**Fig. (2).** An initial flow chart demonstrating the study approach and steps taken in the research.

A study by Al-Mana [25] concluded that there are statistically significant differences between the average responses of the study sample individuals regarding the excessive financial burdens caused by the traffic surveillance system. The results also showed that the sample individuals highly agree that the Saher system reduced accidents caused by speeding and red-light violations. The study by Al-Ajami [26] aimed to assess the impact of the Saher system on vehicle accidents in the Kingdom of Saudi Arabia; its results indicated a 43% decrease in the monitoring of traffic violations after the application of the system compared to the period studied before applying the system. The results also indicated that the system contributed to reducing the total deaths from accidents caused by speeding and red-light violations by 55%; however, it did not significantly affect the total number of deaths from accidents, with the reduction rate reaching only 6%. The system also contributed during the study period to reducing the total injuries from speeding and red-light violation accidents by 56%, while it did not significantly affect the total number of injuries from accidents, as the reduction rate reached only 10%. A study by Factor *et al.* [27] examined a method for inspecting bias in monitoring the speed of vehicles using newly fixed automatic traffic cameras compared to the volume of violations issued without camera monitoring during the period between 2013-2015, and the results indicated that there is no bias during camera monitoring compared to the recording period without it, which contributed to a better level of satisfaction among vehicle drivers.

### 3. METHODOLOGY

#### 3.1. Study Approach

The current study followed the quantitative approach to recognize the orientation of male vehicle drivers from Imam Abdulrahman bin Faisal University staff towards the application of the Saher system. In order to verify whether their attitudes towards the system changed over five years, the male vehicle drivers participated voluntarily in 2016, and they were asked to participate again in 2021. Fig. (2) demonstrates the study approach and steps taken in the research.

#### 3.2. Tools and Samples

The study used a questionnaire, which was constructed after a review of the previous theoretical literature and consisted of two parts: the first was preliminary data that included nationality, age, educational level, daily driving hours, number of violations and type of violation, and the second part consisted of 21 statements about the orientation of vehicle drivers towards the Saher system. The questionnaire was presented to seven specialized arbitrators, and some drafting modifications were made. The responses to the questionnaire statements were based on a Likert scale (*Strongly agree, Agree, Neutral, Reject, Strongly reject*). The questionnaire was administered after obtaining ethical approval for a sample consisting of 761 male individuals from Imam Abdulrahman bin Faisal

University in Dammam, Saudi Arabia, and stabilization was calculated using Cronbach's alpha coefficient, where the constant coefficient was 0.84. Internal consistency was also calculated for linking the statement to the related dimension, and it was limited between 0.32 and 0.67. The questionnaire was shared electronically, and the research sample was asked again five years later to see if their perceptions differed from the beginning of applying the system; 124 agreed to respond again to the questionnaire, and quantitative data were analyzed separately.

## 4. RESULTS

### 4.1. Orientation of Vehicle Drivers toward the Application of the Saher System

In order to verify the vehicle drivers' orientation toward the application of the traffic surveillance camera system (Saher), the arithmetic averages and standard deviations of the questionnaire statement were calculated and sorted in descending order. Table 1 shows the descriptive statistics of the participants' responses toward the implementation of the traffic camera system (Saher). The average of statements ranged between (4.57-1.49) and the highest level of orientation was for "I feel that the traffic and speed enforcement surveillance system (Saher) has contributed to the reduction of passing red traffic signs" (M = 4.57, SD = 0.79), while the lowest was for the statement "Some cars hiding from the traffic surveillance cameras (Saher) is evidence of financial goals only" (M = 1.49, SD = .97).

### 4.2. Predicting the Attitudes of Vehicle Drivers toward the Implementation of the Saher System

The researchers verified the possibility of predicting the attitudes of vehicle drivers towards the Saher system after one year of its application in the eastern region through a set of factors: nationality (V1), age (V2), educational level (V3), driving hours per day (V4), number of traffic violations (V5), and type of violation (V6), among the male employees of Imam Abdulrahman bin Faisal University. In other words, the researchers tried to determine the extent to which these factors (V1, V2, V3, V4, V5, V6) predict the attitudes of vehicle drivers towards the system. Therefore, the multiple regression model was used in the current study. Table 2 shows that the three predictive factors (number of violations, nationality, and type of violation) explained 11.4% of variability in the orientation of vehicle drivers towards the system with a R2 average of 0.114. The multiple regression model shows that the R2 function is  $[F(7, 754) = 14.99, p < .0001]$ .

The most significant contributing factor was the number of violations by a driver over the past year. Beta results showed that 27.9% of the variance is attributable only to the number of violations by a driver over the past year. This factor speaks of the impact of the number of violations on the orientation of vehicle drivers toward the application of the system. Nationality was the second most important factor in predicting the orientation of vehicle

**Table 1. Descriptive statistics of vehicle drivers' orientation towards the Saher system (n = 761), sorted by the mean of vehicle drivers' orientation.**

Q	Vehicle Drivers' Orientation	Mean	SD
1	I feel that "Saher" has contributed to reducing passing red traffic signs.	4.57	0.79
2	I see that alerting "Saher" to the drivers before their violation contributes to modifying behavior.	4.37	0.95
3	The technology of "Saher" has reduced the recklessness of some vehicle drivers over speeding.	3.99	1.19
4	I am satisfied with the contribution of "Saher" in controlling traffic within cities.	3.93	1.11
5	I am reassured by the contribution of "Saher" in achieving discipline while driving vehicles.	3.87	1.10
6	I feel that "Saher" has contributed to reducing the rate of traffic accidents.	3.86	1.10
7	"Saher" has contributed to the monitoring of road speed caps.	3.83	1.05
8	"Saher" led to the conviction of vehicle drivers of the importance of respecting traffic rules.	3.76	1.17
9	"Saher" has succeeded in preventing vehicle drivers from the tragic traffic accident.	3.57	1.20
10	"Saher" contributed to the vehicle drivers' knowledge of traffic laws.	3.56	1.14
11	"Saher" traffic surveillance system severely overstates traffic violations.	2.00	1.17
12	I see the need to devalue violations of "Saher."	1.90	1.19
13	I am heckled by the failure to observe "Saher" to overwhelm the unintended speeding resulting from the driver's concentration in driving.	1.84	0.99
14	I feel it is necessary to increase the speed limit of "Saher" on the highway.	1.74	1.10
15	Disturbed by the failure of "Saher" to alert the driver of the vehicle to an increase in speeding before violating it.	1.70	0.99
16	I prefer to put many warning plates for "Saher" on all roads with close distances.	1.66	0.91
17	Feel uncomfortable with "Saher" doubling the value of violations.	1.65	1.15
18	"Saher" determines the speed on some streets to be disproportionate to their size.	1.64	0.88
19	The "Saher" does not consider the vehicle's historical driver's record of differentiating between regular and others.	1.60	0.87
20	I see that "Saher" guides are insufficient.	1.59	0.83
21	Some cars hiding from "Saher" is evidence of financial goals only	1.49	0.97

**Table 2. Multiple regression analysis to predict the independent variables (nationality, age, educational level, driving hours per day, number of traffic violations, and type of violation) of the attitudes of male drivers towards the Saher system (n = 761).**

Attitudes of Male Vehicle Drivers Towards (Saher)	Items	$\beta$	t	Sig.	F	P	R2 <sub>Adjusted</sub>
-	Nationality	0.181	5.04	0.00	14.99	0.00	114
	Number of Violations	0.279	7.24	0.00			
	Type of Violations	0.074	2.15	0.03			

**Table 3. Differences between the responses of the study sample after the application of the Saher system in 2016 in the city of Dammam and the same sample after five years.**

Vehicles Drivers' Perceptions	2016 - 2021 N 124						
	M	SD	M	SD	df	t	Sig.
-	59.19	9.21	64.52	11.15	123	4.19	.000

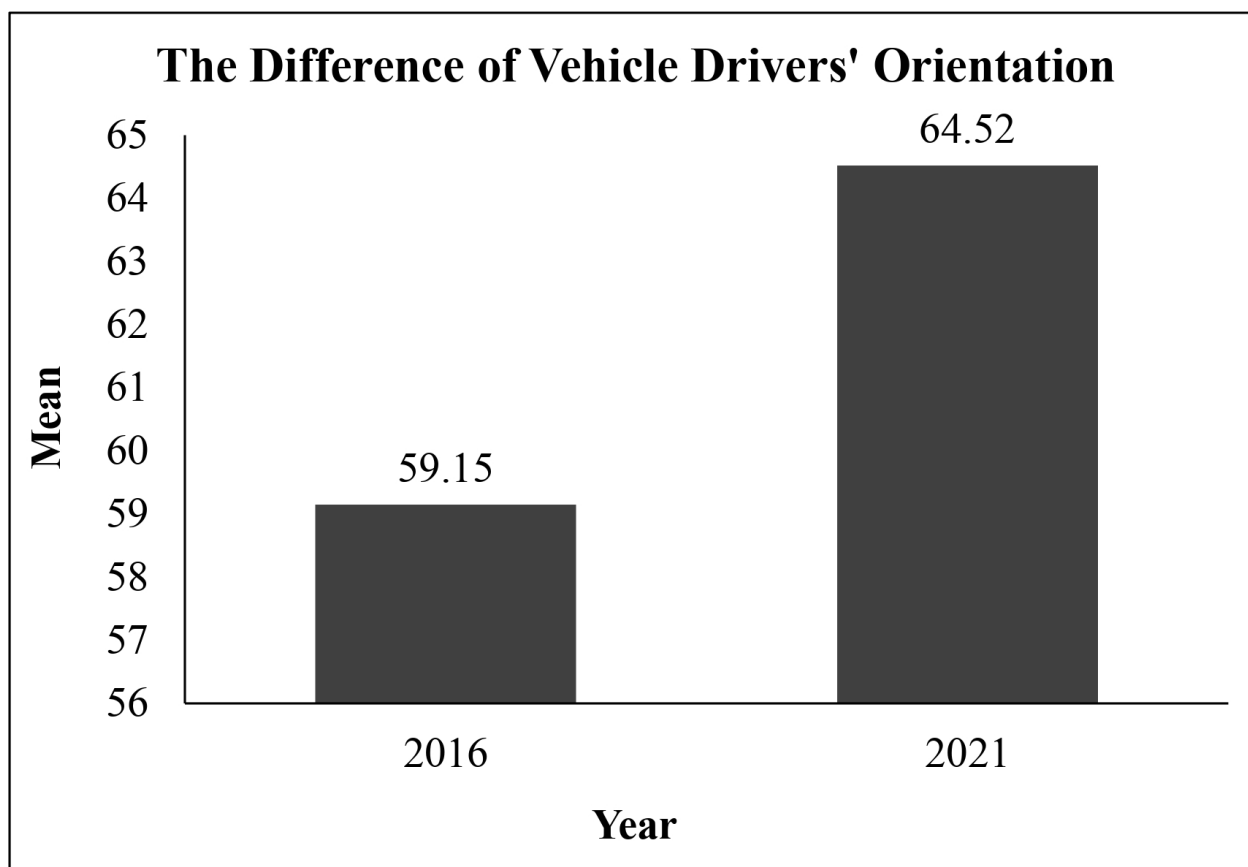
drivers towards the system, as it contributed in 18.1% of the variance. The last factor, the type of violation, contributed only 7.4% to the variance. The rest of the variables (age, educational level, number of hours spent driving, and reason of violation) could not predict the attitudes of vehicle drivers toward the application of the system.

### 4.3. The Differences between the Responses of the Study Sample after the Application of the Saher System

The responses of the study sample were compared

after the application of the Saher system in 2016 in the city of Dammam with the same sample five years later to determine differences in their attitudes towards the application of the system. A *t-test* was used to calculate the significance of the differences between the averages of two related groups.

Table 3 shows that there are statistically significant differences between the sample responses of the study after the application of the Saher system in 2016 in the city of Dammam and the same sample after five years, indicating that their orientation improved, as shown in Fig. (3).



**Fig. (3).** The difference in the attitudes of vehicle drivers towards the Saher system in the first application in 2016 and in the second application five years later in 2021.

## 5. DISCUSSION

The Kingdom of Saudi Arabia has made great efforts to provide traffic safety for drivers, reduce car accidents, and reduce the mortality rate by activating the Saher system, which aims to improve the level of traffic safety at the local level, work to implement traffic regulations accurately and continuously, implement traffic procedures accurately and smoothly, provide a safe traffic environment, and raise the efficiency of the road network in the Kingdom.

The results of the first question indicate that the attitudes of vehicle drivers towards the system were positive, as they appeared high regarding the contribution of the system in reducing the incidences of crossing the red light, alerting vehicle drivers before violating and modifying their behavior, reducing the recklessness of some vehicle drivers using excess speed, contributing to controlling traffic within cities, achieving discipline while driving vehicles, reducing the rate of traffic accidents, pursuing the commitment to the road speeding cap, and raising the vehicle drivers' knowledge of traffic laws.

These orientations appear to be on average in terms of high-value violations as well as the failure to consider the unintended excess speeding due to the driver's

concentration in driving and not alerting the driver to slow down before committing a violation. Additionally, the system does not determine speeding on some roads appropriately. This is consistent with the results of several studies [2, 3, 9, 11], which indicated the feasibility of the system in reducing the rate of accidents, leading to fewer injuries and reducing the number of deaths. They differ from the other studies [8] and [27, 28], as they indicated the system's weak effectiveness in preserving funds and life. This accentuates the support of the University's drivers toward a fair and objective electronic traffic control system because they are more aware and mature.

Saudi society has a wide cultural diversity due to the various nationalities of residents, and it is anticipated that there will be a discrepancy between vehicle drivers of different nationalities because of such cultural diversity. This is demonstrated by the findings of the current study that the different nationalities of vehicle drivers contribute to predicting their orientation towards the Saher system [4]. For example, there is a difference in the behavior of vehicle drivers in the regions of Serbia and northern Kosovo. However, this finding differs from the findings of the study by Al-Wathinani [15], which indicate that the behavior of drivers in Saudi Arabia is compatible with that of other cultures and countries.

To examine in detail the different attitudes and behaviors of vehicle drivers towards the system, researchers consider it important to conduct relevant studies on larger samples covering most segments of society, whereas the current study focuses on the members of Imam Abdulrahman bin Faisal University.

The findings also indicated that the number and type of violations by vehicle drivers predict their orientation towards the system; although the system seeks to achieve traffic safety, some impulsive vehicle drivers who receive various violations may be adversely affected, and this finding is consistent with the findings of the study by Stanojević *et al.* [4] that some vehicle drivers may be trespassing others and perform actions such as driving at high speeds repeatedly and using seat belts less, reflecting their lack of compliance with traffic control systems.

In order for the researchers in the current study to verify the improvement of vehicle drivers' orientation towards the system over time, they obtained the responses of part of the target sample after five years. The results showed differences between the study sample responses after the application of the system in 2016 in Dammam and the same sample after five years, which means they improved their orientation.

In the researchers' view, this result may reflect the resistance by some vehicle drivers at the beginning of applying any new traffic speed enforcement system, but over time, we find out that most of them may be agreeing to the system and welcome its application for the benefits of achieving traffic safety, reducing accidents and injuries, and reducing deaths.

This finding is consistent with Al-Manee's study [25], which found that the Saher system reduced accidents, speeding, and red-light violations, and with the study by Factor *et al.* [27], which found that the traffic surveillance system fulfills objectivity and reduces unfairness towards vehicle drivers since it is an electronic system. However, the study by Al-Ajami [26] disagrees with other findings, as it concluded that although the traffic surveillance system mitigated accidents and reduced the number of deaths, this effect is very minor.

## CONCLUSION

The study aimed to detect the orientation of vehicle drivers toward the Saher system in the Eastern Province of Saudi Arabia using the quantitative method. Quantitative data showed that vehicle drivers' orientation regarding the application of the Saher system was positive, the three variables, number of violations, nationality, and type of violation, contributed to predicting the orientation of vehicle drivers towards the system, and the orientation of vehicle drivers towards the system improved five years later. In this research, there are some demographical challenges that limited women's participation in the study since females started driving vehicles in Saudi Arabia in 2018; therefore, their participation at the time of the study was not feasible since their experience over five years was not completed in 2021. Accordingly, the study recommends conducting a

study using wider societal segments and including women as drivers, as well as focusing on the qualitative aspect of the analysis of the study findings, taking testimonials of the groups that have been involved in accidents and families of groups who have suffered from deaths to investigate their orientations towards the system.

## AUTHORS' CONTRIBUTION

It is hereby acknowledged that all authors have accepted responsibility for the manuscript's content and consented to its submission. They have meticulously reviewed all results and unanimously approved the final version of the manuscript.

## LIST OF ABBREVIATIONS

e-TLE = electronic traffic law enforcement  
GNP = Gross National Products

## ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This research received IRB approval No. (IRB-2021-15-198) by Imam Abdulrahman Bin Faisal University Institutional Review Board Standing Committee.

## HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

## CONSENT FOR PUBLICATION

Informed consent was obtained from all participants.

## STANDARDS OF REPORTING

STROBE guidelines were followed.

## AVAILABILITY OF DATA AND MATERIALS

Some or all data, analysis, or tools that support the findings of this study are available from the corresponding author [A.A] upon reasonable request.

## FUNDING

None.

## CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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