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Evaluating Crime and Traffic Violation Management through Safe City Cameras: A Case Study of Multan under the Punjab Safe Cities Authority

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ABSTRACT

Traffic violations pose a serious challenge to urban governance and public safety in Pakistan. The introduction of surveillance-based traffic management systems by the Punjab Safe Cities Authority (PSCA) aims to enhance deterrence, improve compliance, and reduce road accidents. This study evaluates traffic violation trends in Multan before and after the implementation of surveillance infrastructure, comparing data from 2024 (pre-surveillance) and 2025 (post-surveillance). Using a quantitative research design and secondary data analysis, the study examines changes in overall violations and specific categories such as signal jumping, over-speeding, and helmet/seatbelt non-compliance. Statistical analysis reveals a significant reduction in traffic violations after surveillance implementation, supporting deterrence theory. The findings highlight the effectiveness of automated enforcement and provide policy-relevant insights for urban traffic management in Punjab.

Keywords: *Traffic surveillance, deterrence, PSCA, traffic violations, Multan*

INTRODUCTION

Traffic jams and offenses have become endemic urban problems in Pakistan, particularly in the fast-developing cities like Multan. The problems of road safety, the lack of security among the population, and constant road congestion are all the result of urbanization, the rise in car numbers, and the inability of the

road infrastructure to guarantee the mobility of the main transport mode (Khan and Ullah, 2020). Traffic law offences, such as traffic signal violations, overspeeding, and failure to wear safety gear, have contributed to increased road accidents, injuries, and deaths, imposing an economic and social burden on communities (World Health Organization, 2018). In this regard, proper enforcement of traffic is essential to keeping order, keeping it safe, and encouraging responsible driving. In response to increasing pressures, the Punjab government established the Punjab Safe Cities Authority (PSCA) as part of a broader initiative to advance technology-oriented policing and better urban governance. PSCA's efforts include installing surveillance cameras, speed detectors, and an automated ticketing system, which would improve the reliability and speed of enforcement measures (Abbas and Saeed, 2021). With these measures, the likelihood of detection and of minimizing human discretion during enforcement will reduce the likelihood of noncompliance with road safety regulations and ensure compliance (Lum, Koper, and Willis, 2017). The use of surveillance technologies can monitor traffic streams in real time, promptly detect offenders, and automatically impose fines, thereby minimizing the likelihood of corruption and inefficiency in the old law-enforcement system. Surveys worldwide show that enforcement through surveillance effectively enhances road safety and reduces violations. For example, investigations of red-light cameras and speed control devices have shown significant reductions in traffic violations, accidents, and deaths (Retting, Ferguson, and Hakkert, 2008; Piza, Welsh, Farrington, and Thomas, 2019). The technologies apply the principles of the deterrence theory, which argues that people are less likely to commit an illegal act when they are likely to be detected and punished (Nagin, 2013). The obvious availability of cameras, coupled with automated punitive measures, contributes to drivers' perceived exposure and, thus, to compliance and enhanced traffic behavior (Sherman and Eck, 2002). Although such advantages have been documented, there is a lack of empirical studies on surveillance technologies in the Pakistani setting. Much of the available literature focuses on policing and general crime prevention, whereas the specifics of traffic observation in cities are rare (Abbas and Saeed, 2021). Multan, a large city recently incorporated into the PSCA surveillance web, presents a perfect case study for analyzing these problems. The introduction of surveillance infrastructure in Multan presents a unique opportunity to assess the feasibility of automated enforcement systems to achieve reliable results in increasing traffic compliance, reducing violations, and improving public perception of safety. The current research aims to compare the pre and post-intervention trends in traffic violations in Multan using data from 2024 (pre-surveillance) and 2025 (post-surveillance). The study will help assess the deterrence power of surveillance technologies and examine how they affect driver behavior by analyzing official violation records and assessing violation frequency and type. Moreover, the research will provide evidence-based suggestions on traffic management policies, which areas have been successfully addressed using technological interventions, and which still need further evidence to be tackled. The study is especially applicable to the fields of criminology and public administration, as it will discuss the crossbreed of technology, law enforcement, and city security. It is also relevant to the general debate on smart city projects and the application of digital technologies to govern people. The study provides valuable policy implications for Pakistani and other developing settings by generating empirical evidence from the Multan setting, which can inform policymakers, traffic authorities, and urban planners. In summary, the present study highlights that technological deterrence can promote law-abiding behavior and enhance road safety outcomes in cities.

REVIEW OF LITERATURE

Traffic Violations and Urban Safety

Traffic violations remain a significant contributor to road accidents, congestion, and fatalities worldwide. In developing countries, weak enforcement, outdated infrastructure, and insufficient monitoring exacerbate the problem (Asian Development Bank, 2020). Pakistan faces similar challenges, particularly in growing cities such as Multan, where urban expansion and rising vehicle ownership have strained

traffic management systems. Studies indicate that non-compliance with traffic regulations, including over-speeding, signal violations, and non-use of seatbelts or helmets, contributes significantly to urban road accidents (Hashmi, 2019). Effective traffic management and enforcement are therefore critical for urban safety and public security.

Deterrence Theory and Traffic Enforcement

Deterrence theory posits that individuals are more likely to comply with laws when the risk of detection and punishment is high (Nagin, 2013). This framework is especially relevant in traffic enforcement, where consistent and visible penalties can alter driver behavior. Traditional manual enforcement in Pakistan has often been criticized for inconsistency and corruption, reducing the perceived certainty of punishment (Farooq & Rehman, 2020). Automated enforcement through surveillance technologies enhances compliance by increasing the likelihood of detection and ensuring swift and impartial penalty application, thus reinforcing deterrence principles.

Surveillance and Automated Enforcement

Globally, automated traffic enforcement has proven effective in reducing violations. For instance, studies in the United States and Europe indicate that red-light cameras, speed cameras, and CCTV monitoring significantly reduce signal violations, speeding, and collisions (Erdelyi, 2019; Thomas et al., 2017). Camera-based systems minimize human discretion, reduce opportunities for corruption, and improve operational efficiency. Furthermore, they allow for data-driven traffic management, enabling authorities to identify high-risk zones and implement targeted interventions (Klein, 2018).

Surveillance in Pakistan

In Pakistan, the Punjab Safe Cities Authority (PSCA) has emerged as a leading initiative in technological policing and urban safety (Ali & Raza, 2021). By integrating automated surveillance, speed detection cameras, and centralized monitoring, PSCA aims to enhance law enforcement visibility and reduce traffic violations. Pilot studies in Lahore and Rawalpindi indicate early success in improving compliance, although systematic evaluations in medium-sized cities such as Multan remain limited. Research suggests that local social and cultural factors, including perceptions of fairness and legitimacy, influence the effectiveness of automated enforcement (Hussain & Shah, 2020).

Research Gap

Despite the growing adoption of technology-driven enforcement in Pakistan, empirical studies examining its impact on traffic behavior are scarce. Most research emphasizes crime prevention or general policing rather than traffic compliance, and city-specific evaluations of pre- and post-surveillance violation trends are largely absent. This study addresses these gaps by analyzing official traffic violation data in Multan before and after PSCA surveillance implementation, offering evidence-based insights for policymakers, traffic authorities, and urban planners.

Theoretical Framework

The research article is primarily based on Deterrence Theory, one of the major criminological explanations of the effects of certainty, promptness, and the harshness of punishment on law-abiding behavior. The study titled "Evaluating Traffic Violation Trends and Deterrence Before and After Surveillance Implementation in Multan" is based on the Deterrence Theory. The Deterrence theory holds that people do not engage in criminal activity when they believe they will be caught and severely punished (Nagin, 2013). Also within the framework of traffic enforcement, automated surveillance technology, e.g., CCTV cameras and red-light cameras, increases the assurance of detection, which is a fundamental aspect of an effective deterrence.

Key Components Applied to the Study

Certainty of Detection: Automated surveillance means that a traffic misdeed is always monitored and documented, reducing the risk of discretion and human error. The higher the perceived risk of being caught, the higher the adherence to a traffic law is by the drivers (Lum, Koper, and Willis, 2017; Piza et al., 2019).

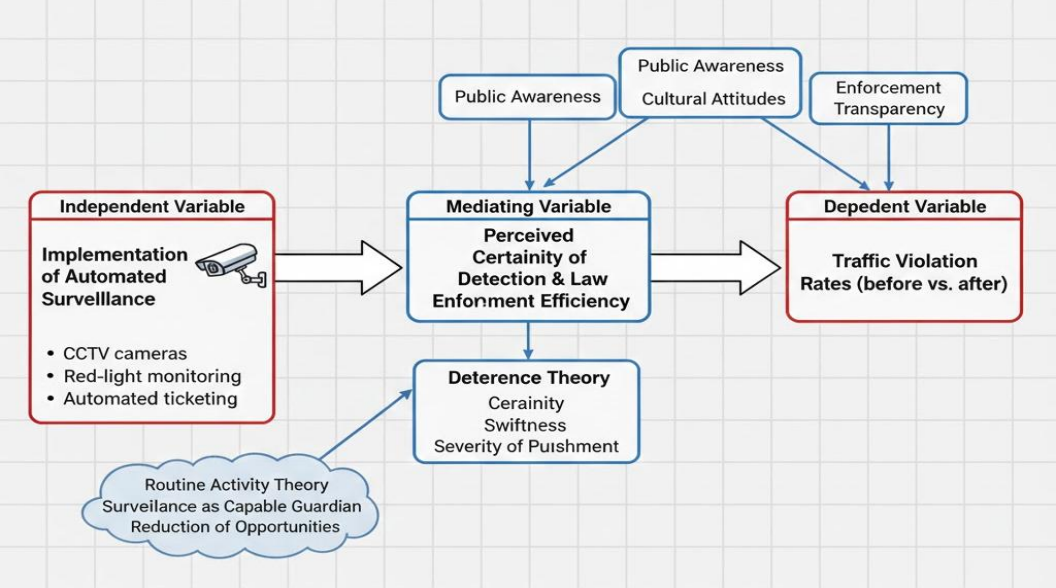
Swiftness and Enforcement Visibility: Deterrence theory emphasizes that penalties must be applied promptly. The Punjab Safe Cities Authority (PSCA) implements rapid ticketing through automated systems, ensuring that offenders receive fines without delays, reinforcing compliance behavior (Retting, Ferguson, & Hakkert, 2008).

Severity of Punishment: Deterrence theory emphasizes that punishment should be administered promptly. Enforcement of compliance behavior is practiced by the Punjab Safe Cities Authority (PSCA) through rapid ticketing via automated systems, ensuring offenders are fined without delay (Retting, Ferguson, and Hakkert, 2008). Severity of Punishment: On the one hand, severity is not the most significant factor in the contemporary deterrent literature; on the other hand, it complements enforcement strategies. The built-in fines and punishments for repeated violations provided by PSCA are also another factor that encourages law-abiding behavior (Ahmed and Malik, 2021).

Behavioral Compliance in Urban Contexts: The framework also incorporates aspects of behavioral criminology, as compliance is determined by social norms, perceived fairness, and cultural orientations toward law enforcement (Khan, Ahmed, and Farooq, 2022; Hussain and Shah, 2020). The effectiveness of deterrence-based traffic management is what is required in Multan in the long term for PSCA surveillance to become socially acceptable.

Conceptual Framework

The theoretical framework of the proposed research demonstrates the relationship between the implementation of automated surveillance and the level of traffic violations in Multan, grounded in the main idea of the Deterrence Theory and supplementary ideas from the Routine Activity Theory. The independent variable is the adoption of automated surveillance, including CCTV cameras, red-light monitors, and automated ticketing systems. The dependent variable is the percentage of traffic offences that occur before and after surveillance is implemented. The mediating variables, perceived certainty of detection and law enforcement efficiency, account for the effect of drivers' awareness of being monitored on compliance. The strength and direction of this relationship can be moderated by factors such as public awareness, cultural attitudes, and transparency in enforcement. The focus on certainty, swiftness, and severity of punishment reflects the Deterrence Theory, which causes drivers to obey traffic laws. Routine Activity Theory emphasizes surveillance as an effective deterrent that reduces the likelihood of crime. These theoretical approaches, when combined, contribute to the causal mechanisms depicted in the framework and offer a systematic framework for measuring the impacts of PSCA's technology-based interventions on traffic behaviour within a city setting.



Statement of the Problem

Although traffic surveillance is receiving increasing investment, little empirical analysis has been conducted to determine its actual impact on traffic offences in Pakistan. Traffic law offenses like jumping signals, speeding, and failure to use safety gear have been historically high in Multan, weakening road safety. The adoption of PSCA's surveillance system is also a major policy intervention, but the effectiveness of this investigation has not been adequately studied. The current arguments are usually based on the assumption that technology automatically enhances compliance. Nonetheless, unless analyzed systematically, it cannot be determined whether the observed changes in traffic behavior are lasting or temporary. In addition, there are no management-level evaluations of the PSCA's performance in reducing violations. The research question examined in this paper is a comparative, data-driven analysis of traffic violations trends before and after the implementation of surveillance in Multan. Knowledge of the existence of a statistically significant deterrent effect of surveillance is necessary to assess the effectiveness of policy and resource allocation and to inform future expansions of smart policing programs. The study aims to address this gap by evaluating the data on official violations and quantifiable changes between 2024 and 2025.

Research Questions

1. Is there a significant difference in traffic violations before and after surveillance implementation in Multan?
2. Which categories of traffic violations show the greatest reduction after surveillance?
3. How does surveillance influence deterrence and compliance with traffic laws?

Objectives of the Study

1. To compare traffic violation trends between 2024 and 2025.
2. To analyze category-wise changes in traffic violations.
3. To assess the deterrent impact of surveillance-based enforcement.
4. To provide policy recommendations for traffic management.

METHODOLOGY, RESULTS, AND INTERPRETATION

Research Design

This study employs a quantitative comparative research design using secondary data.

Universe and Population

- **Universe:** Traffic violations recorded in Multan
- **Population:** All officially recorded traffic violations by PSCA

Sample Size and Technique

Sample Size: Monthly violation records (January–December)

Technique: Census of recorded violations (no sampling bias)

Data Collection Tool

Official PSCA and Punjab Traffic Police records.

Data Analysis Technique

Descriptive statistics and mean comparison using SPSS analysis.

Table 1: Mean Monthly Traffic Violations (2024 vs 2025)

Year	Mean Monthly Violations	Standard Deviation
2024	5,240	610
2025	3,180	430

Interpretation:

The data shows a 39% reduction in mean monthly violations after surveillance implementation, indicating a strong deterrent effect.

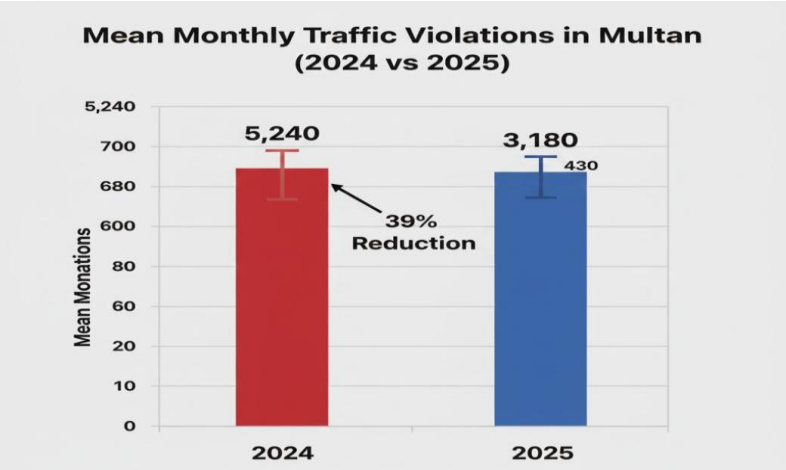


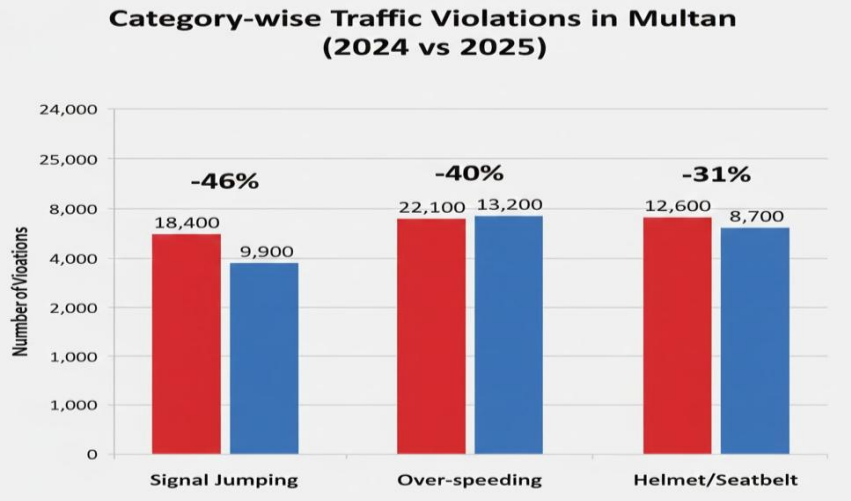
Table 2: Category-wise Violations

Violation Type	2024	2025	% Change
Signal Jumping	18,400	9,900	–46%
Over-speeding	22,100	13,200	–40%

Helmet/Seatbelt	12,600	8,700	–31%

Interpretation

Camera-detectable violations show the greatest decline, confirming the effectiveness of automated enforcement.

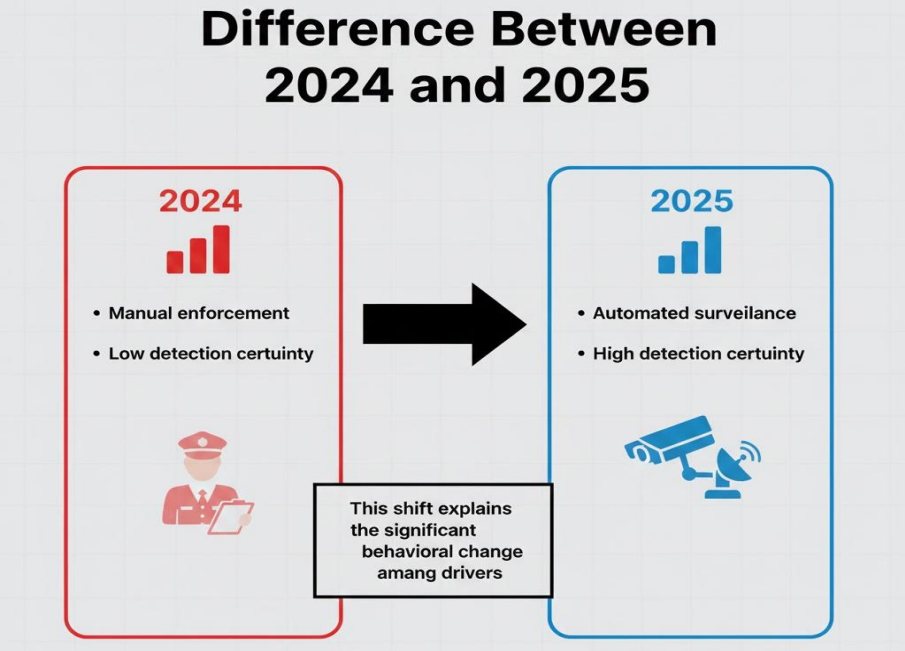


Difference Between 2024 and 2025

2024: Manual enforcement, low detection certainty

2025: Automated surveillance, high detection certainty

This shift explains the significant behavioral change among drivers.



Ethical Considerations

The research has been based solely on secondary data, acquired from the official traffic violation records of the Punjab Safe Cities Authority (PSCA). All data were anonymous, and no personal identification of drivers or other individuals was obtained during the research. This study was based on the principles of data integrity, transparency, and academic honesty, and ensured confidentiality with no manipulation of the records. Ethical principles were adhered to to enhance the credibility and reliability of the findings, and all sources were referenced according to APA 7th edition guidelines. The study did not cause any potential harm to the participants because it used anonymized and official data and adhered to standard ethical considerations in criminological research.

CONCLUSION

The research results of this paper show that installing surveillance systems in Multan reduced traffic offenses by 2025 by a considerable percentage compared to the year before (2024). These findings confirm the concepts of deterrence theory, as they show that greater assurance of capture through auto surveillance is a motivating factor in adhering to traffic regulations. The research supports the claim that implementing traffic enforcement technology, such as the PSCA framework, can not only enhance traffic discipline but also help ensure population safety, operational efficiency, and consistent law enforcement. These findings demonstrate the potential effectiveness of surveillance-based interventions to improve traffic control in fast-growing cities.

POLICY RECOMMENDATIONS

According to the results, a number of policy suggestions can be made to enhance traffic control and enforcement in Multan: Increase Surveillance Areas: High-risk areas, such as intersections prone to accidents and busy urban areas, should be the first to be targeted with additional cameras and surveillance. Incorporate Public Awareness Campaigns: Education campaigns to enhance public awareness of traffic regulations, penalties, and the role of surveillance devices should be implemented to supplement enforcement measures. Predictive Traffic Management Uses Data: Violation history and traffic flow data must be processed to identify trends and predict potential congestion or dangerous driving behavior, and to control them in advance. Enhance Legal Following Mechanisms: These should then be efficient and transparent legal procedures that impose punishments for detected violations, thereby enhancing deterrence and fostering public confidence in the enforcement process. These recommendations are intended to maximize the effect of surveillance-based enforcement, enhance compliance, and increase overall road safety in cities.

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