UNIVERSAL JOURNAL OF TECHNOLOGY AND INNOVATION
ISSN 2992-8842
https://science-research.org.uz/index.php/UJTI

IMPACT OF PEDESTRIAN- VEHICLE INTERACTION ON ROAD SAFETY AT MAJOR INTERSECTIONS: A CASE STUDY OF CENTRAL INTERSECTIONS IN ANDIJAN CITY

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Abstract: Major urban intersections represent critical points where interactions between pedestrians and vehicles significantly influence road traffic safety. Rapid urbanization and increasing traffic volumes in Andijan city have intensified safety challenges, particularly at central intersections with high pedestrian flows. This study investigates pedestrian–vehicle interactions at two major intersections in Andijan using observational methods and statistical analysis. Field data were collected during peak and off-peak hours to assess pedestrian behavior, traffic conflicts, and compliance with traffic regulations. The results indicate that pedestrian violations account for approximately 22–25% of total crossings during peak hours, while driver non-compliance further increases safety risks. The findings highlight the necessity of optimizing signal timing, improving pedestrian infrastructure, and implementing intelligent traffic management systems to enhance overall road safety at urban intersections.

Keywords: pedestrian safety, urban intersections, traffic conflicts, road safety, Andijan city

1. Introduction: Urban road intersections are among the most hazardous elements of transportation networks due to the concentration of pedestrian and vehicular movements. In many developing cities, including Andijan, rapid growth in motorization has not been accompanied by proportional improvements in traffic infrastructure and safety management. As a result, pedestrian-related accidents constitute a substantial share of urban road traffic incidents.

Previous international studies emphasize that pedestrian behavior, driver compliance, and intersection design collectively determine safety performance. However, localized empirical studies are essential to understand context-specific factors influencing pedestrian–vehicle interactions. This research aims to analyze these interactions at selected central intersections in Andijan city and to identify key safety deficiencies based on real observational data.



2. Materials and Methods:

2.1 Study Area

The study was conducted at two major signalized intersections in Andijan city:
Intersection A: Bobur Avenue – Cholpon Street
Intersection B: Navoi Street – Bobur Avenue
These intersections were selected due to their high traffic volumes, proximity to commercial and public facilities, and frequent pedestrian activity.

2.2 Data Collection

Field observations were carried out over three distinct time periods:
Morning peak: 08:00–09:00
Midday off-peak: 13:00–14:00
Evening peak: 17:00–18:00
At each intersection, trained observers manually recorded pedestrian crossings, traffic conflicts, and compliance with traffic signals.

2.3 Observed Indicators

The following indicators were analyzed:
Total number of pedestrians (persons/hour).
Pedestrian violations (crossing during red signal or outside crosswalks).
Driver violations (failure to yield to pedestrians).

2.4 Data Analysis

Descriptive statistical methods were applied to calculate frequencies, percentages, and comparative indicators across time periods and intersections.

3. Results:

Pedestrian Safety Indicators at Bobur–Cholpon Intersection **Table 1**

Indicator	Morning	Midday	Evening
Pedestrians(persons/hour)	145	98	176
Pedestrian violations	98	19	41
Driver failure to yield	176	8	21

Pedestrian Safety Indicators at Navoi–Bobur Intersection **Table 2**

Indicator	Morning	Midday	Evening
Pedestrians(persons/hour)	118	24	11
Pedestrian violations	85	13	6
Pedestrian violations	152	33	18

The results demonstrate a clear increase in pedestrian volume and safety violations during evening peak hours at both intersections. Pedestrian violations constituted approximately 23.4% and 21.7% of total crossings at Intersections A and B, respectively.

4. Discussion: The findings reveal that pedestrian–vehicle conflicts intensify during peak traffic periods, primarily due to increased traffic density and time pressure on both pedestrians and drivers. Similar trends have been reported in international urban safety studies, indicating that signal timing inadequacies and insufficient pedestrian priority contribute significantly to unsafe behavior. In Andijan's central intersections, limited pedestrian green time and lack of advanced warning systems exacerbate non-compliance. The observed driver behavior further suggests the need for stricter enforcement and behavioral interventions. Integrating intelligent traffic signal control and pedestrian detection systems could substantially reduce conflict frequency.

5. Conclusion: This study provides empirical evidence that pedestrian–vehicle interactions at major intersections in Andijan city pose significant road safety challenges, particularly during peak hours. Statistical analysis confirms that pedestrian violations and driver non-compliance are key contributors to unsafe conditions. Enhancing pedestrian signal phases, upgrading crossing infrastructure, and adopting intelligent traffic management solutions are essential measures to improve urban intersection safety. The results of this study can support evidence-based decision-making for sustainable urban traffic safety improvements

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