National Trends and Patterns in Traffic Road Accidents in Pakistan: A Statistical Analysis

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Abstract

This study is of critical importance as it offers an in-depth examination of road traffic accidents, injuries, and fatalities in Pakistan over a decade (2012-2021). By analyzing annual reports from Provincial Police Departments and the A.I.G (operations) of the Islamabad Police, the study reveals significant insights into national statistical trends and normalized indicators. It highlights that while reported data on road traffic fatalities may be relatively accurate, the data on injuries significantly underrepresents the true scale of the issue. A key finding of the study is the disparity in research output on road traffic injuries between Pakistan and other countries, such as India, which contributes only a small fraction to global research. Pakistan's research output in this area is alarmingly low, with fewer than one article per 1,000 road traffic-related deaths. This lack of research impedes the development of effective, evidence-based policies aimed at preventing road traffic injuries and fatalities. The study underscores the importance of grounding road safety policies in robust, local evidence. It highlights the urgent need for improved data collection and research efforts to accurately assess the scope of road traffic issues in Pakistan. Furthermore, it calls for a proactive role from health professionals and their representative organizations to lead and commit to this research endeavor. By addressing these gaps, the study aims to foster the development of targeted, evidence-based strategies that can significantly enhance road safety and reduce the burden of road traffic injuries and fatalities in Pakistan.

Keywords: National Statistics; Road Traffic Accidents; Road Traffic Fatalities.

Introduction

Recent studies have provided significant insights into the dynamics of traffic road accidents in Pakistan. Ahmad et al. (2023) offer a comprehensive analysis of traffic accident trends from 2010 to 2020, highlighting key causes such as road infrastructure and driver behavior, and evaluating the effectiveness of current safety measures. Farooq et al. (2022) focus on the epidemiology of road traffic injuries and fatalities, identifying demographic patterns and gaps in data reporting, and

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suggesting strategies for better injury prevention. Ahmed et al. (2024) review recent road safety interventions, assessing their impact on accident reduction and proposing improvements for enhanced effectiveness. Behavioral factors are explored by Baloch et al. (2023) who investigate driver attitudes and adherence to traffic laws in urban areas, emphasizing the potential of behavioral interventions. Additionally, Qureshi et al. (2023) quantify the economic burden of road traffic accidents, using cost-benefit analysis to advocate for increased investment in road safety measures. Javed et al. (2024) address regional disparities in accident statistics, highlighting variations across provinces and the need for tailored regional strategies. Together, these studies offer a multifaceted view of road traffic issues in Pakistan, underscoring the importance of data accuracy, targeted interventions, and regional considerations in improving road safety.

A road traffic accident (RTA) is any incident involving at least one moving vehicle that takes place on a public road or street and causes injury or death to one or more people. RTAs include crashes involving cars, cars and people, cars and animals, or cars and structural or architectural barriers. These incidents represent a major human tragedy that has resulted in severe suffering and financial losses because of, among other things, early deaths, injuries, and decreased productivity by Provincial Police Departments (crime branch) and the A.I.G (operations) of the Islamabad Police Traffic accidents frequently result in serious injuries and fatalities, disrupting traffic flow and operations. The World Health Organization (WHO) reports that traffic accidents claim the lives of 1.35 million people annually worldwide (Aqib et al., 2020). According to Wang et al. (2017), the average yearly cost of traffic incidents in the United States, including accidents and traffic congestion, is approximately $160 billion. By the end of 2020, estimates indicate that this amount may increase to $192 billion. For children and young adults between the ages of 5 and 29, road traffic injuries are the main cause of death. Despite owning almost 60% of the world's vehicles, 92% of road deaths occur in low- and middle-income nations. Pedestrians, cyclists, and motorcyclists are among the vulnerable road users who account for over half of road traffic deaths. The majority of countries suffer economic losses from traffic crashes, amounting to 3% of their gross domestic product. The ambitious target set by the UN General Assembly is to cut the number of road traffic fatalities and injuries worldwide by 50% by 2030 (A/RES/74/299). In addition, men typically lose their lives in car crashes at a rate of three times that of women. By 2030, road traffic injuries are expected to rise from their present ranking as the eighth most common cause of mortality worldwide across all age groups to the seventh rank. Injuries from automobile accidents can be avoided. To address traffic safety comprehensively, governments must intervene. World health organization (WHO). Road traffic injuries, 23 December 2023 available from WHO (2023) in Pakistan, the motor vehicle population is increasing more rapidly than both economic and population growth. This rapid motorization, combined with the expansion of the road network, has introduced significant challenges, including a rise in road accidents. Provisional /Regional excise and taxation Department updated on 14/06/2024. In Pakistan, road traffic injuries are also a significant public health issue, contributing substantially to mortality and morbidity, particularly among the young and middle-aged population. According to various studies and reports, road traffic accidents are among the leading causes of death in the country. These incidents not only result in a high number of hospitalizations, disabilities, and fatalities but also impose considerable socio-economic burdens on families and the nation as a whole. The situation is exacerbated by factors such as rapid urbanization, increasing motorization, inadequate road infrastructure, and a lack of stringent traffic regulations.

Study Objectives

1. To examine national statistical trends and key indicators of road accidents, injuries, and fatalities in Pakistan
2. To emphasize the importance of developing and implementing road safety policies grounded in local research

National Data of Road Traffic Accidents

Road Accidents in Pakistan

An annual report is published by the Provincial Police Departments (crime branch) and the A.I.G (operations) of the Islamabad Police. This report presents information on various aspects of road accidents in the country annually. It includes data on the number of accidents, the number of people killed, the number of people injured, and the total number of vehicles involved each year. The data is provided on both a national and provincial level. This annual data of the year 2012-21 has been utilized for some national statistics.

Registered Vehicle in Pakistan

An annual report is published by the provincial/regional excise and taxation departments. We utilized data of year (2012-21) on registered vehicles in Pakistan to derive certain statistics, using information available from the regional excise and taxation departments, updated on 14/06/2024. The data on registered vehicles includes details about motorcycles, cars, trucks, tractors, jeeps, and other vehicles involved in road accidents.

Materials and Methods

In this study, we utilized secondary data and employed several analytical methods to examine trends in road accidents, injuries, and fatalities from 2012 to 2021. One of the key methods used was the multi-line chart, which effectively displays trends of multiple variables, such as the total number of road accidents, the number of persons injured, and the number of persons killed over time. Each line in the chart represents a different variable, allowing for easy comparison of trends across the years. Additionally, we employed a bar chart (or column chart) to represent discrete data values. Each vertical bar corresponds to a specific year and its respective numerical value, such as the total number of accidents or fatalities. Bar charts are commonly used to visually compare data across different categories or time periods, helping to identify changes or patterns. The overall method of data presentation in this study falls under descriptive statistical analysis, where key statistics such as the number of accidents, fatalities, and injuries—are shown over a given time frame to reveal trends and patterns. We also incorporated ratio and rate calculations, such as fatality rates and accident severity, to provide a more nuanced understanding of how the severity of accidents has changed over time. This approach aids in identifying critical areas for improvement in road safety by highlighting both the frequency and severity of accidents.

National Statistical Trends of Road Accident, Injuries and Fatalities

Expansion in the road network, a surge in motorization and the rising population in the country contribute toward the increasing numbers of road accidents, road accident injuries and road accident fatalities. The road network in Pakistan, the numbers of registered motor vehicles in the country and the country's population have increased at a compound annual growth rate (CAGR) of 1.81% to 1.85%, from 2012 and 2021 (United Nations - World Population Prospects). During the same period, the number of road accidents in the country increased at a (CAGR) of 1.5%.

Similarly, the number of road accident fatalities and the number of Persons injured in road accidents in the country from 2012 and 2021 increased by 34.49% and 18.84%% respectively, Reported by Provincial Police Departments (crime branch) and the A.I.G (operations) of the Islamabad Police. Even as the CAGR of the number of accidents and the number of road accident injuries has moderated between 2012 to 2021, as compared to the previous decade 2002 to 2011, there has been a spurt in the CAGR of the number of road accident fatalities during the latter period by Provincial Police Departments (crime branch) and the A.I.G (operations) of the Islamabad Police. Between 2012 and 2021 the number of Accident increase 1.154 time accompanied with 1.189 time increase in fatalities, and 1.344 time increase in the number of Persons injured, (Provincial Police Departments (crime branch) and the A.I.G (operations) of the Islamabad Police) against the backbone of 1.710 increase no of registered vehicles in Pakistan, Reported by CEIC annually at the end of June in each year.. During 2021, a total of 10,379 road accident were reported by all region of Pakistan [figure 01]. The Proportion of fatal accidents in the total road accidents has consistently increased since 2012 from 40.1 to 47.3% in 2011. The severity of road accidents measured in terms of persons killed Per 100 accidents has also increased from 50.5 in 2012 to 55.03 in 2021[table 1]. Reported by Provincial Police Departments (crime branch) and the A.I.G (operations) of the Islamabad Police.

Figure 1: Total number of road accidents, Persons killed, and Persons injured: 2012 to 2021

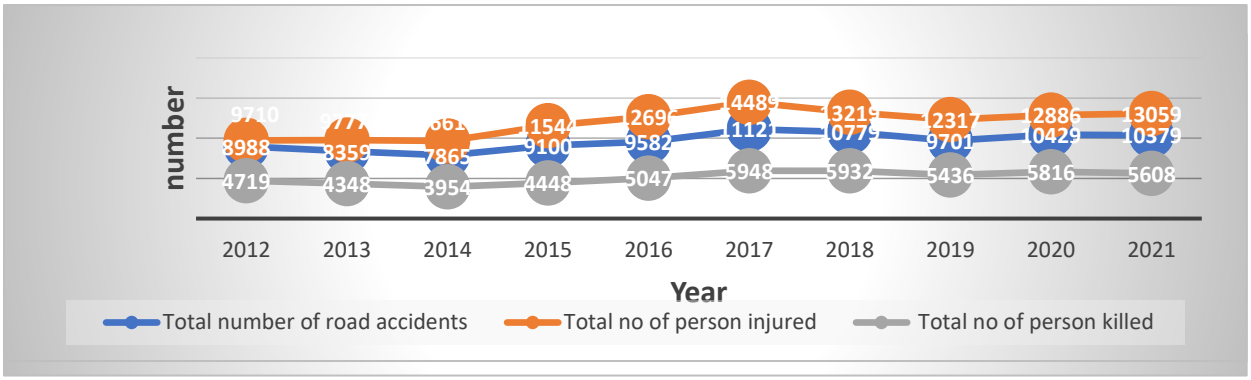


Table 1: Number of road Accident and the number of Persons involved: 2012 to 2021

	No of Accident		No of Persons		Accident
Year	Total	Fatal	Killed	Injured	Severity
2012	8988	3884 (4.03)	4719	9710	50.5
2013	8359	3500 (3.63)	4348	9777	52.01
2014	7865	3214 (3.33)	3954	9661	50.27
2015	9100	3591 (3.73)	4448	11544	48.87
2016	9582	4036 (4.2)	5047	12696	52.67
2017	11121	4829 (5.01)	5948	14489	53.48
2018	10779	4878 (5.06)	5932	13219	55.03
2019	9701	4403 (4.57)	5436	12317	56.03
2020	10429	4721 (4.90)	5816	12886	55.78
2021	10379	4566 (4.74)	5608	13059	55.03

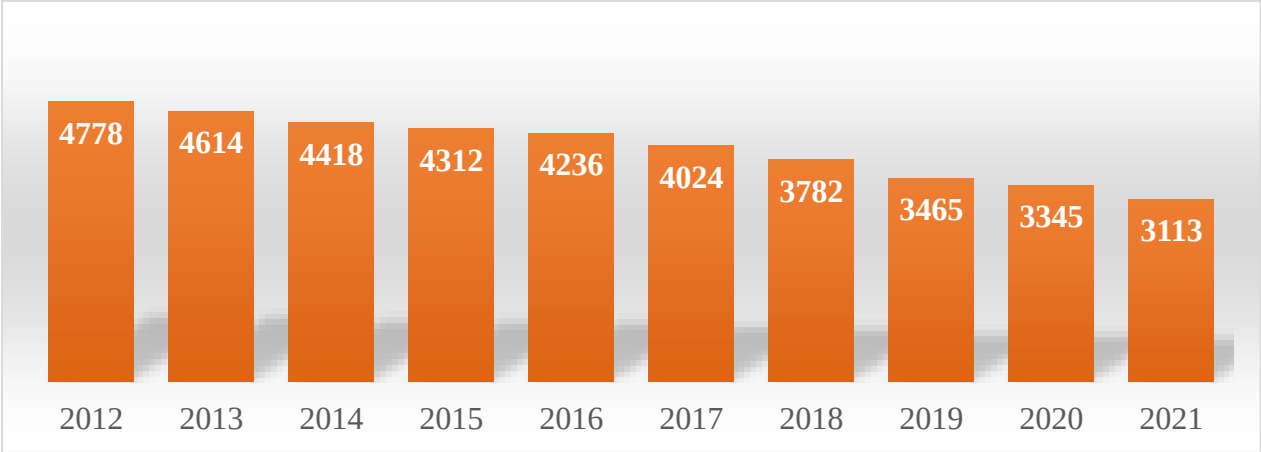
The number of road accidents during 2021 decreased by 0.99 time compared to 2020. This indicates a very slight reduction in the total number of road accidents. On the other hand, the

casualties resulting from these road accidents increased by 1.013 time during 2021 compared to 2020. This means that even though the total number of accidents was nearly the same or slightly lower, the number of people injured in these accidents may be increase in a certain year, by Provincial Police Departments (crime branch) and the A.I.G (operations) of the Islamabad Police

Normalized Indicators of Road Accidents, Injuries and Fatalities in Pakistan

To get an appropriate measure of the incidence of accidents, the normalized/standardized accident rates for Pakistan have been worked out in terms of the number of accidents/injuries/fatalities (a) per lakh persons (b) per ten thousand motor vehicles and (c) per ten thousand kilometres of road length. A significant decline in the number of accidents per ten thousand motor vehicles is discernible from 9100 in 2012 to 6774 in 2021.There has been more than a two-fold increase in the number of persons injured per lakh of population from 13 in 2012 to 32.3 in 2021, while persons killed per lakh of population jumped three-fold from 2.7 in 2012 to 9.8 in 2021. Exposure of population to road accidents leading to deaths and injuries largely depends on the amount of travel undertaken, defined as the number of trips, the distance traveled or time in the road environment, number of motor vehicles and the amount of motorized traffic, and so on. As regards the number of persons injured and killed per 10,000 vehicles the decline has been dramatic. The number of persons injured per 10,000 vehicles has declined from 9831 in 2012 to 8354 in 2021. Similarly, the number of persons killed per 10,000 vehicles in the country has also fallen from about 4778 in 2012 to 3584 in 2021 by Provincial Police Departments (crime branch) and the A.I.G (operations) of the Islamabad Police.

Figure 2: Number of Persons killed Per ten thousand vehicles involved 2012-2021



Inter-Regional Comparison

Table 2 provides a share of top three regions of Pakistan among (Islamabad, Sindh, Punjab, Baluchistan and Khyber Pakhtunkhwa) with regard to the total number of road accident, persons killed, and Person injured in road accidents against a backdrop of their share in Pakistan register vehicle Population.

Table 2: Number of accidents				
Years	**2018**	**2019**	**2020**	**2021**
Top* 3 Region: Share in total number of road accident in (%)				
Share of top 3 Region	94.0	93.2	94.3	95
Punjab	44.8	44.3	43.7	44.9
Khyber Pakhtunkhwa	40.2	40.1	41.4	41.6
Sindh	9.0	8.8	9.2	8.5
Share of the Above total register vehicle	18.4	19.2	19.9	10.1
Top* 3 Region: Share in total number of Person killed in (%)				
Share of top 3 Region	92.1	92.4	92.2	92.0
Punjab	57.7	57.0	56.9	58.8
Khyber Pakhtunkhwa	22.2	21.8	22.2	21.3
Sindh	12.2	13.6	13.1	11.8
Share of the above 3 Region In total registered vehicle	18.4	19.2	19.9	20.8
Top* 3 Region: Share in total number of Person killed in (%)				
Share of top 3 Region	97.8	93.7	94.5	96.6
Punjab	47.7	46.6	44.8	46.3
Khyber Pakhtunkhwa	43.9	41.1	43.4	43.8
Sindh	6.2	6.0	6.3	6.5
Share of the Above 3 Region In total register vehicle	18.4	19.2	19.9	20.7
Top* 3 According to the Respective share from 2018 to 2021				
All Pakistan shares of selected Top* 3 Region in (%) road accidents, injuries, deaths and registered motor vehicles (Reported by CEIC annually at the end of June in each year)				
: 2018 to 2021				

Punjab and Khyber Pakhtunkhwa are the regions with the highest number of road accidents, with Punjab consistently contributing around 44% and Khyber Pakhtunkhwa around 40%. Sindh's contribution is lower but stable. Punjab also has the highest share of road accident fatalities, followed by Khyber Pakhtunkhwa and Sindh. The fatality share of Punjab is significant, consistently above 56%. When considering the number of registered vehicles, Punjab and Khyber Pakhtunkhwa still have a high share of accidents compared to Sindh. This suggests that accidents are more frequent in these regions relative to the number of vehicles (reported by CEIC annually at the end of June in each year). Based on the 2017 census data, Pakistan has two megacities and ten cities with populations exceeding ten million. There are also 100 cities with populations of 100,000 or more. Among these 100 cities, the majority (58) are in Punjab. Karachi, with a population of 14.9 million as of the 2017 census, reported the highest number of road accidents in 2016. The breakdown of accident victims includes approximately 295,589 (64%) motorbike users, 54,481 (12%) rickshaw passengers, 39,900 (8%) car occupants, 12,411 (3%) truck drivers, and 20,342 (4%) from Sindh, with fewer incidents in Khyber Pakhtunkhwa (11), Baluchistan (6), Azad Kashmir (2).

Characteristic of Road Traffic Accidents in Pakistan

Spatial Distribution

In 2021, the total number of accidents that occurred in rural areas (53.5%) was more than that in the urban areas (46.5%). Rural areas had more fatalities (63.4%) than urban areas (36.6 %). The number of persons injured was also more in rural areas (59.4 %), as compared to urban areas (40.6 %), by Provincial Police Departments (Crime Branch) and the A.I.G (Operations) of the Islamabad Police.

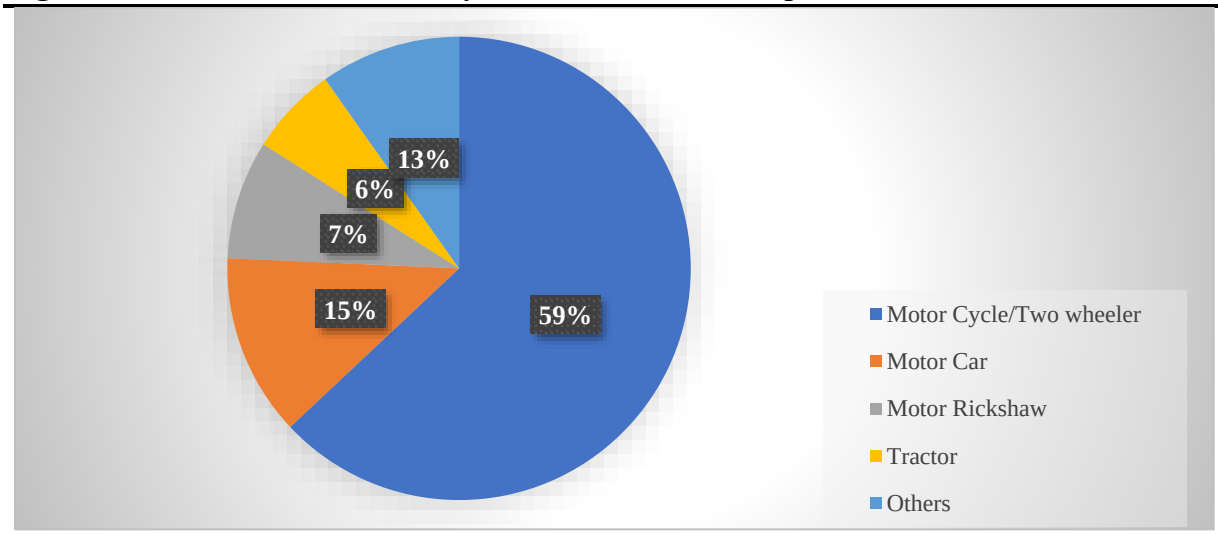
Age and Gender of Accident Victims

The detailed age profile of accident victims other than the drivers, for the year 2021, revealed that the age group between 16 and 30 years accounted for the largest share, 50.9%, of total road accident casualties, followed by the age group between 31 and 60 years, with a share of 35.8%. Youngers are often more involved in accidents due to factors like inexperience, risk-taking behavior, and sometimes a lack of adherence to traffic rules. Only 16% of the road accident victims were females during the calendar year 2021, by provincial Police Departments (crime branch) and the A.I.G (operations) of the Islamabad Police.

Mode of Transport

During 2021, (59%) of the victims of road accidents were occupants of two wheelers. Although the break-up of total government and private vehicles is not available, it is pertinent to note that the majority of victims were traveling in private vehicles. Followed (13%) of the deaths occurred due Motor car, and 10% deaths occurred due to others (crane, taxi, truck etc. (provisional /regional excise and taxation department).

Figure 3: Road Accident deaths by various mode of transport



Months of Occurrence

In 2021, the months wise-distribution of road accidents has shown more accidents during the month of July (9.4%) followed by the month of October (8.8%) and May (8.83%), while at least number of road accident were reported in the month of January (7.4%). Punjab and Khyber Pakhtunkhwa which accounted for (10.1%) and (9.9%) of road accidents in the country, respectively have also reported the maximum number of road accidents during each month of the

year at the national level, by Police Departments (crime branch) and the A.I.G (operations) of the Islamabad Police.

Time of Occurrence

In 2021, 16.7% of road accidents occurred between 1500 and 1800 hours (daytime), followed by 16.6% between 1800 and 2100 hours (evening), and 6.3% between 0000 and 0300 hours (late night), by Provincial Police Departments (crime branch) and the A.I.G (operations) of the Islamabad Police.

Discussion

The analysis of road accidents in Pakistan for 2021 reveals that while the total number of accidents slightly decreased compared to 2020, the severity of accidents increased, with more injuries and fatalities reported. Over the last decade, there has been a significant decline in accidents per ten thousand motor vehicles, but the number of injuries and deaths per lakh of the population has risen sharply. Punjab and Khyber Pakhtunkhwa account for the majority of accidents and fatalities, even though these provinces have fewer registered vehicles than Sindh, indicating higher accident frequency and severity. Rural areas report more accidents and fatalities than urban areas, likely due to factors such as inadequate infrastructure and higher speeds. Motorcyclists, who made up 59% of the victims, are particularly vulnerable, highlighting the need for targeted safety measures. The findings underscore the importance of region-specific interventions, better traffic law enforcement, improved road safety infrastructure, and enhanced emergency services to address the growing severity of road accidents.

Causes

The major human factors that contribute to the potency of road accident causation in Pakistan include distracted driving, over speeding, reckless driving, running red lights, running stop sign, teenage driver, unsafe lane changes, wrong way driving, improper turns, tire blowouts, fog and street racing (Kazmi, 2020).

Conclusion

In this study we investigate results of the data between 2012 and 2021, Pakistan saw significant growth in its road network, vehicle registrations, and population, which unfortunately coincided with an increase in road accidents, fatalities, and injuries. Although the overall frequency of accidents per vehicle decreased, the severity of these accidents worsened, with a notable rise in fatalities. Punjab and Khyber Pakhtunkhwa were identified as the regions with the highest rates of accidents and deaths. Motorcyclists were particularly vulnerable, highlighting the need for targeted safety measures. To address these issues, several strategies are essential: implementing comprehensive road safety campaigns to promote safe driving practices, investing in road infrastructure improvements, enforcing stricter traffic regulations, and focusing on the specific needs of motorcyclists through measures like mandatory helmet laws and improved safety gear. Additionally, tailoring road safety strategies to high-accident regions and using data-driven approaches for policy-making can further enhance the effectiveness of these interventions. By adopting these measures, Pakistan can aim to reduce both the frequency and severity of road accidents, ultimately improving overall road safety and decreasing the impact of traffic-related injuries and fatalities.

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