Investigation and Analysis of Road Traffic Accidents in Hefei City

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Abstract: Hefei is the largest city in Anhui Province, and its traffic volume is increasing day by day, and traffic accidents will follow. Therefore, aiming at the traffic road safety problems in Hefei, this paper investigates and analyzes the causes of road traffic accidents in Hefei by visiting questionnaires and collecting data, and concludes that drivers' driving behavior is an important factor leading to traffic accidents, such as driving and calling, changing lanes and overtaking in a hurry, etc. With the increase of traffic demand, it is necessary for relevant departments to make corresponding measures to reduce the traffic accident rate through investigation and analysis, so as to improve the safety ability of road traffic and further ensure the safety of citizens' lives and property.

1 Introduction

In recent years, the number of motor vehicles in China has continued to increase by about 13%. According to statistics, by the end of 2013, the number of motor vehicles in China had reached 250 million. As we all know, motor vehicles bring convenience and economic benefits to people. At the same time, traffic accidents have become a worldwide problem, which has seriously affected the development of urban road traffic and caused huge losses of life and property. Although the number of traffic accidents in China has been in a downward trend in recent years, it is still necessary to reduce the rate of traffic accidents and improve traffic safety. Only by improving traffic safety can people's lives and property be further protected.

2 Analysis on the Causes of Traffic Accidents in Hefei

Based on the investigation of traffic accidents in Hefei in recent years, it is found that there are four main causes of traffic accidents in Hefei. The first is that the quality of drivers is not high, the second is the performance defects of motor vehicles, the third is the nonstandard road design, and the fourth is the poor traffic environment. Many of the traffic accidents in Hefei from 2010 to 2013 are caused by the above four reasons, as shown in table 1, which is the proportion of traffic accidents in Hefei from 2010 to 2013.

Table 1 Distribution of Causes of Traffic Accidents in Hefei From 2010 to 2013

Causes of traffic accidents	2010	2011	2012	2013
The quality of drivers is not high	59%	56%	53%	50%

Performance defects of motor vehicles	12%	18%	22%	20%
Nonstandard road design	13%	11%	10%	8%
Poor traffic environment	16%	15%	15%	22%

From the above table, we can see that the quality of drivers accounts for a large proportion in the causes of traffic accidents. In recent years, the quality of motor vehicle drivers in Hefei has been rising, but the vehicle performance defects are becoming more and more obvious. As for the nonstandard design of streets and roads in Hefei, the traffic planning department of Hefei has improved in recent years, but the traffic environment is relatively unstable. The article analyzes the specific causes of traffic accidents in Hefei, which is summarized as follows.

2.1 Driver Problem Investigation

The low quality of motor vehicle drivers is mainly manifested in two aspects: illegal operation and lack of driving experience. Illegal operation, as its name implies, is a violation of road traffic law, which poses a great threat to the personal safety and property safety of pedestrians and other vehicles. However, lack of driving experience mainly means that drivers operate large vehicles when they are under the age of driving, or drivers don't know how to deal with emergencies, and traffic accidents caused by not giving way according to regulations often occur at road intersections without traffic control. According to traffic laws and regulations, at such intersections, vehicles on roads with lower grades should stop for observation before passing through the intersections, and restart passing through the intersections when there are no vehicles on roads with higher grades. However, in reality, many drivers have a weak sense of safety, ignore traffic laws and regulations, and rush to

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drive in order to save themselves time, which leads to the frequent occurrence of such accidents.

Drivers should not only have psychological quality as a guarantee, but also have considerable experience in driving. In the process of judgment and decision-making, if the driver's actions are inconsistent with the actual purpose due to the lack of cognitive ability, knowledge level and driving experience, it will cause traffic accidents. However, the driver's driving experience has a great influence on his experience and psychological quality. Therefore, driving experience is also a significant factor affecting the severity of traffic accidents.

We can find that there are many traffic accidents caused by drivers' illegal operation, among which the casualties caused by drivers' illegal overtaking are relatively large, among which 252 people died due to drivers' illegal overtaking, accounting for 19.4% of the total deaths, 189 people died due to violation of traffic indicators, accounting for 14.5% of the total deaths, and 175 people died due to illegal lane change, accounting for 13.5% of the total deaths. The number of deaths caused by other reasons is 488, accounting for 37.6% of the total number of deaths, including drivers calling while driving, dozing off, smoking, drunk driving, etc., which fully reflects that drivers' own quality is an important factor leading to traffic accidents. Therefore, Hefei should strictly manage drivers' driving skills and illegal operation, and only in this way can the current situation of traffic accidents in Hefei be solved.

2.2 Investigation on Factors of Motor Vehicle Performance Defects

Vehicle failures that cause traffic accidents mainly include brake failure, steering failure, lighting failure, tire burst and other mechanical failures. These faults may exist when the vehicle is manufactured, but they are usually caused by the untimely maintenance and repair of the vehicle. However, there are too many private cars and too complex brands and models in Hefei, which lead to inconsistent vehicle performance. Many traffic accidents are caused by unilateral vehicle performance defects, which lead to two cars colliding or hitting pedestrians. Through the investigation and analysis of traffic accidents in Hefei from 2010 to 2013, the accidents caused by motor vehicle performance defects are briefly introduced and summarized as shown in Table 2.

Table 2 Traffic Accidents Caused by Performance Defects

Performance defect category	2010	2011	2012	2013
Brake failure	23%	45%	48%	35%
turn towards	22%	10%	12%	20%
Lighting failure	10%	12%	17%	15%
Tire burst	25%	18%	13%	16%
Other faults	20%	15%	10%	14%

From Table 2, we can see that there are many traffic accidents caused by automobile performance defects in Hefei during the four years from 2010 to 2013, and

automobile factors account for a considerable proportion of traffic accidents. There are many factors in traffic accidents, such as traffic accidents caused by automobile design and manufacturing, accidents related to automobile design and manufacturing, and accidents related to automobile casualties, as well as changes in motor vehicle performance parameters caused by serious overload and overspeed. Therefore, it is important to strengthen the analysis of vehicle factors in traffic accidents for the correct analysis of accident responsibility.

2.3 Investigation on Relevant Factors of Road Design

Urban roads are divided into expressways, trunk roads, secondary trunk roads and branch roads. For non-urban roads, the higher the highway grade, the better the safety facilities and the better the road safety performance; Urban roads pay attention to grading and matching, and do not highlight the improvement of road grades. Urban roads are the types of roads prone to traffic accidents. During the four years from 2010 to 2013, there were more than 3,200 traffic accidents on the main roads in Hefei, accounting for 29% of the total traffic accidents in these four years. The reason for this is that the main roads are the main places of urban road traffic, and most of the urban traffic is concentrated on the main roads, which is prone to traffic accidents.

In Hefei, there are many traffic accidents in the past four years because of the road surface condition, which mainly refers to the cleanliness and humidity of the road surface containing attachments. Adhesion performance of pavement refers to the ability of pavement to provide adhesion to running vehicles, that is, to provide maximum ground braking force. The adhesion performance of pavement is determined by the adhesion coefficient of pavement. With the increase of adhesion coefficient, the adhesion performance of pavement is better, and vice versa. The sliding adhesion coefficient of clean and dry concrete pavement and asphalt pavement is about 0.75, and the adhesion performance of pavement is relatively good. If there are sand, dust and other attachments on the road surface, the adhesion performance of the road surface will decrease, and its adhesion coefficient will drop below 0.5, which will restrict the running state of vehicles and affect the running safety of vehicles. If the adhesion performance of the road surface deteriorates, the vehicles traveling in a straight line are more likely to have rear-end collision, while the vehicles traveling in corners are more likely to have side slip.

2.4 Investigation of Traffic Environment Factors

Traffic is an orderly group activity, but violations of traffic laws often occur. The existence of traffic control methods such as police and traffic lights can effectively reduce illegal behaviors and improve traffic safety. According to the investigation and analysis of traffic accidents in Hefei during the four years from 2010 to

2013, the traffic accidents caused by traffic environment are mainly divided into weather and traffic command degree. The specific investigation results are shown in Tables 3 and 4.

Table 3 Traffic Accidents Caused by Weather

Bad climate	2010	2011	2012	2013
Heavy rain	24%	28%	32%	25%
Snow	18%	17%	13%	17%
Dense fog	23%	20%	20%	18%
Sunny day	25%	15%	25%	22%
Dust and sand	10%	20%	10%	28%

Table 4 Traffic Accidents Caused by Traffic Command Degree

Traffic command project	2010	2011	2012	2013
Traffic police command	42%	40%	32%	21%
Signal light	18%	23%	25%	25%
Marking and marking	23%	27%	23%	24%
Other safety equipment	17%	10%	20%	30%

From tables 3 and 4, we can see that the traffic accidents caused by weather and traffic command degree in Hefei during the four years from 2010 to 2013 are decreasing year by year. From 2010 to 2013, the proportion of traffic accidents caused by heavy rain increased from 24% to 25%, and the proportion of traffic accidents caused by snow increased from 18% to 17%. The proportion of traffic accidents caused by foggy weather has decreased from 23% to 18%, while that caused by sunny days has decreased from 25% to 15%, while that caused by dusty weather has increased from 10% to 28%.

The traffic accidents caused by poor traffic command have also improved. Traffic accidents caused by traffic police command have decreased from 42% to 21%, traffic accidents caused by signal lamp failure have increased from 18% to 23%, traffic accidents caused by signs and markings have increased from 23% to 27%, and traffic accidents caused by other safety equipment have decreased from 17% to 30%. Therefore, relevant departments in Hefei should strengthen the rectification of traffic environment to avoid environmental reasons.

3 Road Traffic Accident Prevention Measures in Hefei City

3.1 Strengthen the Management of Drivers' Driving Behavior

Motor vehicle drivers should have a strong sense of consciously abiding by laws and regulations, have good moral cultivation, always maintain a safe and courteous driving style, be highly responsible to society, others and themselves, develop good safe driving habits, and have a solid sense of psychological security. Cultural quality has an indirect but deep influence on the incidence of urban traffic accidents. Urban motor vehicle drivers must have graduated from junior high school or above, master

basic knowledge of social science and natural science, such as laws, traffic regulations, physics, chemistry and geography, and be able to accept, learn and master new knowledge quickly. The proficiency of driving skills has a direct impact on the occurrence of urban road traffic accidents. Drivers must have basic skills in vehicle maintenance such as troubleshooting. Be able to quickly identify various traffic signs and road conditions, and drive vehicles skillfully according to sign requirements and operation specifications.

3.2 Establish Vehicle Maintenance Mechanism

We should raise our awareness of the importance of motor vehicle maintenance, inspection and maintenance, and earnestly fulfill the safety maintenance regulations, so as to discover and eliminate hidden dangers in time, especially whether the performance of key components and systems such as braking, steering and tires is normal or not, and we should be aware of it, check every day, check every time before going on the road, and be vigilant during driving. For the motor vehicle management of logistics enterprises and transportation enterprises, it is necessary to implement the three-level inspection system, the vehicle return inspection system, and the parts procurement warehousing inspection system in the whole process of automobile maintenance inspection. For example, the quality of tires is directly related to the life safety of vehicles, drivers and passengers. Accidents caused by flat tires during high-speed driving often occur, and it is difficult for general maintenance stores and 4S stores to detect the internal quality of tires, mainly by tire manufacturers and quality supervision departments; For another example, the man-machine interface design of motor vehicles is closely related to the handling and safety of vehicles. It is necessary for drivers to drive the vehicles accurately and comfortably in normal operation, and it is also necessary to ensure the effective control of vehicles by personnel in special and unexpected situations, otherwise accidents will be caused or accident losses will be aggravated.

3.3 Standardize the Design of Roads

The traffic department of Hefei should try to meet the requirements of dynamics and ergonomics when designing roads. It mainly includes: the spatial alignment of the road centerline is reasonable; The sight distance of the driver's safe driving reaches the standard, that is, the longest distance of the road ahead can be clearly seen during driving to meet the specification requirements; The road structure conforms to the regional characteristics of the subgrade, and the pavement has sufficient strength, good flatness and skid resistance; The design of intersection direction and connecting sections conforms to scientific principles, which not only ensures smooth running of vehicles, but also ensures braking safety. Great efforts should be made to build road safety facilities, including pedestrian overpasses, pedestrian signal lights, pedestrian and vehicle separation barriers, disabled passages, traffic signs such as safety signs and

markings, road safety clearance and roadblocks, etc. Measures should be taken to continuously improve the technical level of road safety facilities, and scientific theories such as safety science, ergonomics and psychology should be comprehensively applied to earnestly implement the people-oriented management concept. For example, when setting up pedestrian-vehicle diversion and isolation belt, we should not only consider the safe and smooth running of motor vehicles, but also fully take care of the convenience of pedestrians, especially the elderly, children, the disabled and other vulnerable groups in road traffic. Otherwise, illegal behaviors such as pedestrians crossing the road, robbing and forcing, crossing the isolation belt, etc. will cause de facto inducing factors, which is not conducive to traffic safety.

3.4 To Improve the Traffic Environment

Road greening can beautify the road traffic environment, improve the city appearance, road spatial characteristics, and improve the psychological feelings of drivers and traffic participants, which is of positive significance to traffic safety. However, when carrying out road greening, we should pay attention to the relationship between greening and road lighting, driver's sight distance and other safety requirements, so as to help drivers maintain good sight distance, sight guidance and good mentality when operating vehicles. In addition, the traffic department of Hefei should also consider the actual situation. For the lack of lighting equipment on some traffic arteries, it should increase the construction of lighting intensity. Because the road transportation in Hefei city is increasingly busy at night, and the lighting intensity has a significant impact on traffic safety, the road lighting must meet the driver's safety needs, with bright sight, normal display of road scenery and stability. In view of traffic safety and energy saving, measures can be taken to increase illumination within the specified night transportation time and appropriately reduce road lighting outside the specified time to save electric energy, thus achieving both effects.

4 Conclusion

Nowadays, with the increasing number of cars, we must reduce the occurrence of traffic accidents in order to ensure the development of road capacity and the safety of people's lives and property. This time, through the investigation and analysis of traffic accidents in Hefei, the following conclusions are drawn:

1. There are many factors that lead to traffic accidents, among which drivers' driving behavior and safety awareness are the main ones. According to the survey, most traffic accidents are related to drivers, so relevant departments should strengthen management and supervision.
2. The improvement of road traffic facilities can also reduce the occurrence of traffic accidents;
3. Irregular road design is also a factor leading to traffic accidents;

4. Motor vehicle performance defects can easily lead to traffic accidents, such as brake failure and steering wheel failure. Therefore, the vehicle needs to be inspected regularly.

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