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Insight into Vision Disorders: Their Role in Traffic Accidents

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Abstract
Road accidents will kill 1.35 billion people worldwide by 2030, or 3,700 each day, according to the WHO. Some estimates put vision impairment at blame for 20% of car accidents (WHO, 2021). Uncorrected refractive problems, cataracts, and age-related macular degeneration cause most vision loss. Safe driving requires good visual, mental, and motor skills. Good eyesight not only involves 20/20 vision but also depth perception, contrast sensitivity, peripheral vision, and colour vision. Poor vision makes it harder to see traffic signs, other vehicles, and barriers, making drivers more prone to crash. Vision impairments and their impact on crashes can be treated to prevent traffic injuries and make roads safer for everyone, due to the risk they pose to themselves and others, several governments do not allow visually impaired drivers to drive. There are specific visual problems that can make driving unsafe or impossible. If India enforced eye tests every five years, visually impaired drivers may be recognised and cured before driving. This would significantly advance the fight against impaired driving due to poor eyesight. Treatments for weak eyesight may enhance driving safety, according to one study. Getting one's vision tested is one of the best ways to make the roads safer and decrease accidents.

Keywords: Vision disorders, traffic accidents, vehicles, vision impairment

Introduction

The World Health Organisation (2021) aims to halve road accident fatalities and injuries by 2030. Low-and middle-income countries have more road traffic deaths than high-income ones. According to India's National Crime Records Bureau, Tamil Nadu, Madhya Pradesh, and Karnataka had the most traffic accidents between 18:00 and 21:00 and 15:00 and 18:00. Speeding or careless driving killed most vehicle crash victims. Males > 70% had more road traffic accidents (Pradhan *et al*., 2023) [43] especially students. Due to urbanisation, urban migration, and rising car ownership, the burden is growing. Driving safely requires high visual acuity, visual field, colour discrimination (useful for reading traffic lights and road signs), and contrast sensitivity. Traffic deaths kill more young males than any other demographic. India has among of the highest traffic accident and road death rates in the world due to its developing condition. Traffic accidents kill about 150,000 Indians annually, and the Ministry of Road Transport and Highways estimated a 3.3% increase between 2019 and 2020. In recent years, the Indian government has intensified road safety efforts and traffic enforcement to reduce automotive accident fatalities and injuries. National traffic accidents and fatalities have dropped, but road safety must be improved. The World Health Organisation promotes eye disease prevention and control, vision screening, eye care, rehabilitation, low vision services, and road safety education. Vision impairment affects millions worldwide, making it a huge public health issue. Approximately 2.2 billion people, or 8% of the global population, are blind or visually impaired. One billion cases have gone untreated or could have been averted (WHO 2019). Cataracts, glaucoma, and uncorrected refractive errors cause most vision loss. These three illnesses cause almost 75% of vision impairment. Untreated refractive problems put 1.1 billion people at risk for vision impairment (WHO 2021). Visual impairments are rising worldwide due to ageing populations, lifestyle changes, and diabetes and other chronic diseases. The widespread use of digital screens and devices contributes to eye problems. Regardless of severity, vision impairments can lower a person's quality of life. Glaucoma, cataracts, and diabetic retinopathy cause most vision loss and car accidents, according to research by Yohan 2019. A vision test is required for driver's licence applications

in India, although renewal exams are not. This suggests that gradual visual impairments may hinder drivers' safety, which they may not realise until it's too late. If vision exams were mandated every five years, the RTO might find drivers with visual issues and require treatment before letting them drive. If all Indian drivers could perceive and react to changing road conditions, accidents would decrease and road safety would improve. The RTO would require more money to hire more people and buy more testing equipment to enforce this regulation. Despite the high initial cost, lower accident rates and improved road safety may be worth it.

Table 1: Some of the key factors contributing to the high rate of traffic accidents include:

Cause	Contributing Factors
Human Error	Distracted, Speeding, DUI, Reckless driving
Poor Road Conditions	Deteriorated roads Unmarked roads, poor visibility
Vehicle Defects	Defective brakes, Tyres, Steering systems, Other mechanical issues
Driver Fatigue	Sleepy drivers
Inexperienced Drivers	Inexperienced driving
Poor Traffic Management	Uncontrolled traffic e.g. signs, signals)
Environmental Factors	Excessive rain, Fog, Snow
Aggressive Driving	Tailgating, Interrupting other drivers Traffic-weaving
Pedestrian & Cyclist Safety	Poor pedestrian/cyclist infrastructure
Traffic Congestion	Heavy traffic, Driver impatience

DUI: Driving under influence.

Table 2: Un-known facts in road safety

Motorcyclists, cyclists, and pedestrians	46% of global road deaths.
Speeding	Is a considerable risk factor, increasing the likelihood of a crash and the severity of injuries.
Suiting up Seatbelt	Can cut collision fatalities by 50%.
Alcohol and substance abuse	Increase road traffic crashes and impair driving.
Road traffic crashes	Leads to medical expenses, lost productivity, and property damage.
Wearing a good quality helmet	Motorbike riders and passengers by 42% and 70%.
Mobile Phones	Chatting on a cell phone raises the crash rate by 4%, and texting by 23%.
80% of automobiles sold fail to meet essential safety features	Just 40 countries follow all 7 safety features.

Accidents on the Road and Vision Impairment:

Road traffic accidents are already the largest cause of mortality for those aged 5 to 29 (WHO), and they are projected to overtake firearms as the seventh leading cause of death worldwide by 2030 (Piyasena, P., *et al*., 2021). According to the World Health Organisation (2021), a number of factors contribute to road accidents. These include speeding, driving under the influence of alcohol or other psychoactive substances, not wearing a motorbike helmet or seatbelt, not having child restraints, being distracted while driving, using a mobile during diving (Yohannes *et al*., 2018) [24], having an unsafe vehicle, having inadequate post-crash care and having insufficient law enforcement of traffic laws. Since 1931, the prevalence of myopia has grown (Irving, E. L., Machan, *et al*., 2019) [2], and the condition's severity has worsened. Professor Ashish Verma of the "Indian Institute of Science's" Civil Engineering Department claims that a research was undertaken in 2016 to investigate the impact that drivers' eyesight has on traffic safety. More than half of Indian drivers who cause traffic accidents had at least one vision impairment, according to the research of 387 professional drivers from the Karnataka Road Transport Corporation and the Bangalore Metropolitan Transport Corporation. Researchers investigating the impact of driver eyesight on road safety found that those with visual impairments were 81% more likely to be in a collision. The first step towards slowing down is setting national speed restrictions. Best practises recommend setting maximum speed limits in urban areas to less than or equal to 50 kilometres per hour. Road accidents, in contrast to illnesses and disorders, are rarely acknowledged (Hassen *et al*., 2011) [25]. Improving road safety, vehicle safety, and post-crash care, as well as speed management, reducing drunk driving, mandating the use of motorcycle helmets, and requiring children under the age of ten to use child restraints are all things that should be practised in all countries.

Rescue Professionals at the Scene of a Vehicle Collapse

People who are involved in traffic accidents in India may or may not have access to emergency services, depending on factors such as the accident's location and severity. The amount of deaths is directly proportional to how quickly emergency rescue services are able to get on the scene (Matveev *et al*., 2018) [29]. Ambulance services are a staple of emergency response systems and are often the first point of contact for those injured in vehicular collisions. They have first aid kits and trained employees on board so that victims can receive prompt care and be sent to a hospital if necessary. The fire department might be summoned to the scene of a collision to help free trapped passengers and put out any flames. The police play a crucial role in managing traffic accidents by maintaining order, determining what caused the incident, and aiding the injured. Individuals injured in vehicular collisions typically seek medical care and rehabilitation in hospitals. The Indian government has taken measures in recent years to enhance the quality of medical care provided to victims of automobile accidents. It initiated initiatives to enhance pre-existing emergency services, such as the 108 ambulance service in Tamil Nadu. However, issues still necessitate resolution. Various emergency agencies don't coordinate with one another, there isn't enough qualified personnel, and the infrastructure is inadequate. This might help guarantee that they receive the treatment and assistance they require to recover from their wounds.

Method

After doing an initial search using the stated keywords on Google Scholar, Web of Science, Research Gate, and other relevant sites, 1511 articles were found; from these, 400 articles were selected as relevant to the study topics. After sorting the data into like and unlike categories and arriving at a conclusion, 114 articles remained. The phrase "vision disorders contributing to traffic accidents" to filter the final review papers down to a manageable 48 articles. Articles published in 2014 or later were utilised for the study, for a total of 37, with a keyword search also included.

Visual Conditions that Contribute to Traffic Accidents

Driver's licence requirements vary greatly from one nation to the next (Desapriya, E., 2014) [6]. Attempts have been made by several nations to establish universally accepted requirements for acquiring a driver's licence (Behboudi, *et al.* 2017) [5]. Due to the reduced visibility caused by the night time hours, night-time driving can be particularly problematic for persons suffering from certain eye problems (Jacobson *et al*., 2022) [37]. Night driving can be complicated by a number of vision problems, including Nyctalopia (night blindness), Cataracts can make it hard to see at night because of glare and halos surrounding lights. Reduced central vision from age-related macular degeneration (AMD) makes it more challenging to perceive road details and obstructions, especially at night. Glaucoma: individuals with glaucoma have an increased risk of motor vehicle accidents compared to those without the condition (Lee *et al*., 2014) [20]. Glaucoma is a group of eye diseases that can damage the optic nerve, resulting in vision loss and a reduction in peripheral vision. This can make it difficult for drivers to detect objects or hazards on the road, such as pedestrians, cyclists, or other vehicles. Anybody who has these or any other visual problems should see an ophthalmologist frequently for check-ups and discuss their driving skills with them. In a study with 2000 drivers in USA with a medical record of glaucoma, of them 14% drivers had one or more at fault motor vehicle collision in the past 5 years (Kwon *et al*., 2016) [21]. Eye disorders such as cataracts, glaucoma, and age-related macular degeneration and other retinal ailments can significantly impact an individual's vision and increase the risk of traffic accidents. It is crucial to detect and treat these eye disorders early on to prevent any potential harm to oneself or others on the road. They may need to drive only during the daytime or stop driving at all throughout the night. They might also be given prescription driving glasses with yellow lenses to reduce glare and improve their night vision. Regular eye exams, healthy lifestyle habits, and proper eye protection can help reduce the risk of developing vision disorders and protect our precious sight.

Disabilities and Wellness Issues Resulting from Automobile Accidents

Physical and mental impairments sustained in a car crash can change a victim's life in significant ways. The accident type, the victim's age and health, the severity of their injuries, and the extent to which they were disabled are only few of the variables that will determine the specifics of the impairment (Esmaili *et al*., 2021) [26]. The following are among the most often experienced impairments following a road traffic incident: Injuries to the spinal cord, which can potentially cause paralysis and immobility, Memory loss, trouble speaking or moving, and alterations in behaviour and mood are just some of the cognitive and physical disabilities that may result from a traumatic brain injury (TBI) (Huang *et al*., 2018) [33].

Both the initial injury and later medical treatment might lead to amputation in a traffic accident. Accidents on the road can lead to serious injuries, including burns, if the involved car catches fire. Broken bones, fractures, and dislocations are frequent orthopaedic injuries sustained in car accidents, and they sometimes necessitate surgical intervention or rehabilitative care (Xavier *et al*., 2023) [34]. If the victim of a traffic accident has suffered significant trauma or the loss of a loved one, they may develop a variety of psychological disorders such as depression, anxiety, post-traumatic stress disorder (PTSD), phobias, shock, sexual dysfunction, sleep disturbances, loss of appetite, and changes in behaviour (Djelantik *et al*., 202, (Yohannes *et al*., 2018) [24]. In addition to this many people have listed post traumatic headache (PTH) and neck pain (Cancelliere *et al*., 2021) [28]. Disabled people who sustain their injuries in a vehicle crash may need ongoing medical treatment, therapy, and assistance. Physical treatment, occupational therapy, and counselling are all part of this, and they can be expensive, especially if the injured individual can't work while recovering from their injury (Dhufera *et al*., 2022) [35]. People who are disabled as a consequence of a car accident should get the help they need to adjust to their new circumstances and get their lives back on track. For some, this means pursuing financial aid via programmes like disability benefits or compensation claims, while for others it means dealing with healthcare providers, rehabilitation experts, and mental health professionals, many people do not have a valid health care coverage plan (Wagstaff *et al*., 2018). Loss of a principal income source can put a heavy financial burden on the rest of the family, especially if they relied on that income. As a result, you may have trouble paying your expenses and buying food. With the correct help, the survivors may begin to put their lives back together and feel safe and secure again.

Safety Measures to Implement

Due to age-related eyesight changes, awarding a driving licence to an elderly person should be based on their functional capacity rather than their age alone (Keltner & Johnson, 1987), By 2030, it is predicted that older drivers would account for a quarter of all traffic accidents. (Bayam *et al*., 2005) [27]. Studies show that the mortality rate for pedestrians struck by vehicles driving at 65 kilometres per hour is four times higher than that for pedestrians struck by vehicles going at 50 kilometres per hour. Improving road design (roundabouts, pedestrian crossings, and bike lanes) is just one piece of the puzzle that must be solved in order to reduce traffic accidents (Kharola *et al*., 2010) [31]. New electronic safety systems in automobiles include seatbelts, airbags, parking sensors, anti-lock brakes, and accident detection and avoidance, which may minimise injuries and save lives in accidents. (Saritha *et al*., 2023) [32]. And the frequency of traffic accidents can be reduced with the introduction of fully aided vehicles. As cited in Winkle, T, 2016 Accident rates can be lowered by driver conduct (such as by requiring seatbelt use, enforcing speed limits, and discouraging distracted driving). Education and awareness campaigns, as well as tough rules against drunk driving and speeding, are also important. Better ambulance and trauma facility services for emergency situations. To prevent traffic accidents and improve road safety, it is crucial to take all of these into account, Traffic cameras enforce road safety laws. These cameras detect road activities, identify speed, and catch violators, It provides effective ways to keep drivers and pedestrians safe (Pawar & Attar, 2022) [30]. The United States Department of Transportation reports a 10% increase in gas mileage and a 90% decrease in traffic accidents. Future accidents may be reduced with the use of autonomous vehicles and other forms of cutting-edge driver aid technology. License the elderly often avoid because of fear for losing their driving licenses (Kobal & Hawlina, 2022) [44].

Conclusion

Both internationally and in India, poor eyesight has been identified as a leading contributor to vehicular mishaps.

Drivers' failure to anticipate hazards and respond appropriately is a common cause of accidents and injuries. As road safety has been a major issue in India for many years, it is concerning that so many drivers suffer from vision problems. It is urgent that steps to lessen the possibility of road traffic collisions, such as regular eye exams for drivers, proper road signs, the separation of lanes, pavements, and bridges, and the improvement of city planning to reduce traffic congestion, be put into place. Defensive and smart driving, as well as regular car inspections, can help keep drivers safer on the road. Education focused at drivers on the necessity of maintaining great vision and taking necessary precautions, such as wearing corrective eyeglasses, can prevent accidents caused by impaired eyesight. Together, we can make our roads safer and avoid preventable deaths by addressing the issue of vision abnormalities in the context of road safety through awareness programmes like working with communities to promote road safety initiatives and providing information and training on safe driving practises. The prevalence of potentially crippling illnesses like cataracts and macular degeneration can be reduced by conducting yearly eye checks for drivers, and this has been shown to save lives. The paper concludes with recommendations for policymakers, medical experts, and drivers to enhance eye health and reduce the number of accidents.

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