

A Review of Types of Injuries Sustained Following Road Traffic Accidents and their Prevention

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ABSTRACT

Road traffic (RTA) accidents are a common cause of morbidity and mortality in all parts of the world. As an epidemiological problem, the control of the host (accident victim), the agent (the vehicle) and environmental factors involved in their causation should be considered. The health personnel who look after accident victims need to know the injury types and their mechanisms encountered in RTA. The accident victim can be the occupant of a motorcar, a motorcyclist, pillion passenger, a cyclist or a pedestrian. Motorcar occupant can be the driver who may sustain injury to the wrists, forearm and pelvis or fracture of the ribs from the steering wheel. The driver and other front seat passenger can have lacerations on the face from hitting the windscreen, characteristic bruises and lacerations to the knees and skin from the dashboard or cervical spine injury through whiplash injury if there are no headrests on the seats. Backseat passenger may hit the back of the front seat or the sides of the car. Any of the occupants can be thrown out of the vehicle if the door springs open. Motor cyclists, pillion passengers, cyclists and pedestrians hit by a moving vehicle sustain primary and secondary impact injuries from the impact with the body of the vehicle, and or secondary injuries when they hit the ground or other object. Alcohol is an important factor in the cause of RTA, but additionally, some medical conditions such as advanced diabetes, hypertension, some prescribed drugs like tranquillisers and sedatives, stress and diseases that blunt locomotion and sensations in the elderly can influence the causation of accidents. Prevention will involve control of the host factors – illnesses, alcohol, accident repeaters and enforcement of driving regulations; agent factors – through better vehicle design using human engineering; and environmental factors through better road design and maintenance (*Nig J Surg Res 2000; 2:100-104*)

KEY WORDS: Road Traffic Accidents (RTA), epidemiology, prevention

Introduction

Road traffic accidents are some of the important causes of morbidity and mortality in developing and developed countries.¹ Various studies have shown Nigeria and other developing countries to have some of the highest rates of road traffic accident (RTA) in the world and with increasing yearly trend.^{2, 3, 4} These have been attributed to

various factors, including poor road infrastructure, human factors and vehicles that are not road worthy.

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Suggestions have been made that RTA should be approached as an epidemiological problem with the aim of controlling host (the victim), agent (the vehicle), and environmental factors.^{1,3} In this regard, health personnel who look after accident victims need information on the various types of injuries accident victims may sustain, their mechanisms, and medical conditions with increased accident risk. Adeloye and Odeku,⁵ Asogwa,³ and Rafindadi⁶ have highlighted the medical and other aspects of RTA in various parts of Nigeria, but there is still need for more information on the mechanism and injury types sustained by road accident victims, and this review is meant to address this.

Road Traffic Accidents in Relation to other Accidents

Accidents can occur on highways, at home, workplace, school or recreational facilities. All types of accidents threaten a large segment of the population. In those aged 1 - 35 years, accidents constitute the leading cause of death in industrialised countries, and in those who are older, accidents are surpassed only by cancer, heart disease and degenerative diseases.¹ In these countries, road traffic accidents constitute about 40% of all types of accidents combined.⁷ Hospital-based studies from our Nigeria indicate that RTA may be responsible for up to 80% of all deaths resulting from all types of accident.⁸ In developing countries where statistics are not always available or reliable, reports indicate that road traffic accidents most commonly involve those 20-40 years, the most mobile segment of the population, and are an important cause of death in the same age group.^{5,6} In all countries of the world including developing ones RTAs by incapacitating and killing those in the productive age group impose an enormous burden on the national resources, in terms of healthcare cost and loss of man hours. In the United Kingdom, about 6,000 to 7,000 deaths per annum occur as a result of RTA.⁹ Nigeria, a developing country having less than 10% of the

number of motor vehicles in the UK had an average of 10,860 yearly deaths between 1985 to 1988.¹⁰ The causes of accidents are not always known, but, alcohol, mechanical malfunction, inadequate design of vehicles and highways, and medical disorders are important factors in their causation.^{1,11}

Injury Types in Road Traffic Accidents

Following an RTA, the injured victim may be the driver or other occupants of the motor vehicle, a pedestrian, a motorcyclist, a pillion passenger or a cyclist.

- a) *Occupants of a motor vehicle:* may be the driver, other front seat or backseat passenger. Driver/front seat passengers - show characteristic lacerations and injuries to the skin and knees from dashboard impact, and injuries to the head and face from the windscreen. There may be crush injury with fracture of the ribs and sternum if the seat moves forward or the steering moves backwards. Fracture dislocation of the cervical vertebrae may occur due to whiplash effect. The driver may have a momentary appreciation that an accident is about to happen and take some of the force on his hands on the steering wheel therefore avoiding the windscreen. In the process he may sustain injuries to the wrist, forearm, pelvis and femur. Backseat passenger- there is no windscreen or dashboard to hit in the back seat. Injury is due to striking the top or side of the vehicle or the back of front seat. Any of the occupants may be flung out of the vehicle if the door springs open. Use of safety equipment by passengers like seatbelt, headrest, collapsible steering or airbag may modify any of the above injuries. Use of seatbelt is occasionally associated with injuries in the form of linear bruises to bowel and mesentery, strap-like abrasions over anterior aspect of the

shoulder and clavicle, and rarely spinal injuries. These rare occurrences should not be interpreted as valid argument against the use of seatbelt.

b) *Injuries sustained by pedestrians:* These injuries are classified into:-

- I. Primary impact injury - to the first part struck by the vehicle/object.
- II. Secondary impact injury - caused by a further impact to the vehicle by the victim.
- III. Secondary injury – when the victim strikes another object or the ground.

Primary impact injury depends on the position of the person in relation to the vehicle when struck. When a person is struck from behind, the primary impact is to the back of the legs. If the feet slide then **secondary impact injury** will involve the back of the head hitting the windscreen. If the feet are fixed then no secondary impact injuries are seen instead **secondary injuries** to the knees, palms and face occur as the body is pushed forward. If a pedestrian is hit sideways, primary impact bruises always involve the lower legs; secondary impact injuries lead to bruises on the elbow and fracture of the ribs in old people. On hitting the ground, secondary injuries on the opposite side may result in fracture of the parietal and temporal skull bones with severe contusion of the contralateral side of the brain due to sudden deceleration.

c) *Injuries sustained by cyclists:* When hit by a motor vehicle, injuries will be similar to those sustained by pedestrians, except that the primary impact will be to the lower part of the body. Secondary injuries will be more severe because of greater distance of fall.

d) *Injuries sustained by motorcyclists:* They may be knocked down by a moving vehicle and sustain primary injuries to the legs followed by secondary impact wounds when

they hit the vehicle. Further secondary wounds occur when they strike the ground. Their injuries are usually more severe than those of cyclists because of the higher momentum involved. In certain circumstances, the motorcyclist may hit a stationary object or vehicle, in which case severe head injuries are sustained, which may be modified by wearing a helmet.

Examination of the injured RTA victim

- a) Body - note type and nature of injury, tyre mark, height of injury from the heel, direction of bruises and the presence of foreign material on skin or wound.
- b) Clothing - note any tears, contamination by oil or grease and presence of foreign fragments such as glass or paint.
- c) Vehicle - note the damages to the body, presence of blood, flesh or hairs and any signs of attempt at repair.

Medical Diseases and Accident Risk

Diseases contribute significantly to injury and death sustained in road accidents especially to car occupants and pedestrians.^{11, 12} There are four ways by which a medical condition could affect or increase accident risk while driving. However, before such a disease becomes significant with respect to accident causation, it must be immediately incapacitating otherwise the driver may have time to pull into the roadside.

- a) *Advanced forms of diabetes mellitus, cardiac condition and epilepsy* are associated with the likelihood of sudden impairment or loss of consciousness.¹ More commonly they could lead to impaired sensorium, decreased awareness, impaired co-ordination and disturbed balance. The criteria used to advice on physical fitness to drive in most of these conditions have not been precisely established, as it is difficult

to know when a diabetic or a hypertensive is at risk of developing sudden complications that may affect safe driving.

- b) *Temporary states and conditions:* These include fatigue, emotional upset, stress and illness. They may have the same but lesser effects than in (a).
- c) *Prescribed drugs and medications taken for minor ailments:* It is the principal actions or side effects of these drugs that may impair driving safety. For example the sedative effect of tranquillisers may last for more than 24 hours. Dangerous attitude of overconfidence is associated with tranquillisers. Painkillers are associated with slowed reaction time, disturbance of vision and equilibrium.
- d) *In elderly pedestrians,* diseases that blunt locomotion and perception are common and these affect their response to traffic.

Alcohol and Driving Safety

Evidence on the causative role of alcohol in road accidents has been conclusively shown in scientific studies.¹⁻¹³ Driving performance deteriorates at alcohol blood levels of 0.03%. Significant deterioration occurs at 0.10%, and the risk of accident doubles when the blood level rises from 0.05% to 0.10%. When it reaches 0.15% the increase is ten fold. It is estimated that 50% of all fatal accidents involve alcohol in a causal manner.¹ Alcohol as an important epidemiological factor in accident is more amenable to control when compared to other environmental influences such as road design and median barriers.

Control and Prevention of Accidents

This involves the control of host (driver), agent

(vehicle) and environmental factors.

- a) *The host factors:* Important ones are age, sex, fatigue, alcohol, illness, physical, physiological and psychological characteristics of the host. In adolescents and the young, accidents are the leading cause of injury and death in the developed countries. This may be related to the inexperience of youth and their temperamental qualities. Pedestrians involved in accidents are usually above 69 years in the developed countries while in the developing ones it is children who are the victims.²⁻⁶ Males to female ratio is three to one for all age groups while it rises to 6 to 1 in the age group 20-40 years. An accident repeater, the concept of the accident-prone personality identifies those with an inherent and persistent liability to have accidents. This is associated with maladjustment to ordinary personal and social demands of living. These individuals are well known to various social agencies like the courts and clinics for venereal disease.¹
- b) *The agent:* These are the objects (vehicles) by which destructive forces are delivered to the body. Design features by vehicle manufacturers have improved transport safety (human engineering) through improved braking and steering system, lighting, tires, adequate dimensions and adjustability of seats, location and design of controls. Windscreen and window frame design for maximum visibility and designs for crash protection for occupants (airbag, collapsible steering and non-spring doors).
- c) *The environment:* Poor design of highways, road signs, and adverse driving conditions such as extremes of temperature, rain and snow or sleet, which make roads slippery all increase driving risk. Poor visibility reduces the efficiency of vision, while the use of tinted windscreen may present a special hazard at night especially for the elderly driver whose eyes cannot accommodate fast enough.

Role of the Doctor in Accident Prevention

The doctor is in a good position as a driver and someone who treats accident victims to contribute in accident prevention and control. He is in direct contact with the victim of accident and could use this opportunity to indoctrinate the driver on good driving habits. Specifically, the doctor's role can be enumerated as below;

1. Provision of effective emergency service.
2. Co-operation with authorities to remove hazardous drivers through blood alcohol tests.
3. Assist the motor registration officers to provide sound policies regarding drivers with medical problems.
4. Participate in research programs directed towards acquisition of basic knowledge about accident cause.
5. Indoctrination of individual patients about medical fitness and other risks related to road safety.

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