

Community 432Medicine

1 INJURY EPIDEMIOLOGY Objectives

- Describe the concepts of injuries
- Understand how people get injured in their daily lives
- Describe important differences between various types of injuries
- Understand principles of injury prevention and control
- Apply injury epidemiology principles to road traffic incidents



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- CONCEPTS & CLASSIFICATIONS

Definitions

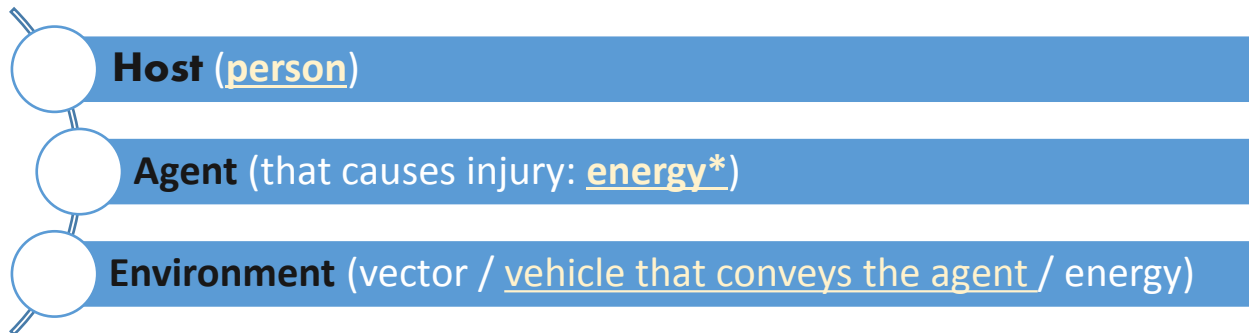
Injury (Incidental)

Acute exposure to agents such as mechanical energy, heat, electricity, chemicals, and ionising radiation interacting with the body in amounts or at rates that **exceed the threshold of human tolerance**. In some cases, injuries result from the sudden lack of essential agents such as oxygen or heat

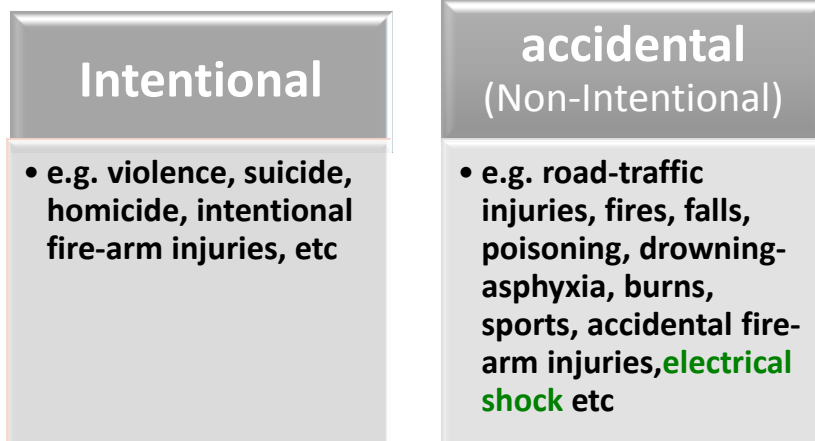
Violence (Intentional)

The intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation **includes suicide and homicide**.

- Epidemiologic Triad of Injuries

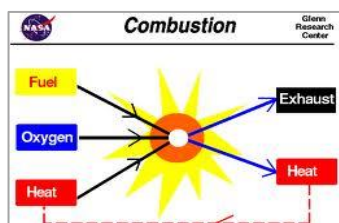


- Types of Injuries



*Nature of Energy

1-Mechanical	2-Thermal / Chemical	3-Electrical	4-Asphyxiation
<p>- If a person must stop suddenly, as in a crash of a vehicle, that energy must be dissipated in the vehicle, environment, or individual's tissues (Person's energy according to physic's law will be dissipated in surrounding environment and the energy will be ether absorbed by the environment or reflected back to the person)</p> <p>- When the vehicle stops, the occupant will continue to move at the pre-crash speed into interior structures, or into the materials in the exterior environment if ejected.</p> <p>- Stresses(all cause injury): contact with energy source generates forces counter to the load. Types: tension (pulling molecules apart), compression (pushing molecules together), shear/cut (from a tangential force)</p> <p>- Strain: extent of deformation, resulting from tension, compression, shear.</p> <p>The shape and elasticity of the materials struck will determine the damage to the tissue.</p> <p><u>Devices as seat-belts, air bags and child restraints reduce the severity of injury by reducing contact with less flexible structures (second collision)</u></p> <p>Advantages of: 1-air-bag-> reduce stress and ribs+sternal fractures. 2-Seat-belt: restrain the person and protect his/her back.</p>	<p>Deaths and injuries associated with fires, heat & smoke are the result of ignition sources, flammable materials and of the heat and chemical energies generated by burning or heating materials (e.g. cigarettes, matches, gas stoves, electrical circuits / appliances).</p> <p>Physics / chemistry of combustion(fire) vary by: -Concentration and type of heat source -Shape / size of a combustibile -Oxygen concentration -Vaporization of gases -Presence or absence of catalysts.</p> <p>Chemicals may be breathed / inhaled (as in a fire); ingested; injected; absorbed</p> <p>Harms of chemicals are divided into 3 phases: 1-exposure (poisoning) 2- toxo-kinetic (chemical's absorption through the organism's membranes: GIT, lungs' air sacs). 3-toxo-dynamic (interaction of chemical with receptors in target tissues)</p>	<p>Atoms are made up of electrons, protons and neutrons</p> <p>The flow of electrons is "electrical current" >The human's body is an excellent electrical conductor.</p> <p>The extent of damage of human tissues in contact with electrical energy increases with amperage(strength of electrical current)</p> <p>Skin sensitivity varies 100-fold as a function of wetness (100,000 ohms when dry; 100 ohms when wet).</p>	<p>-Humans cannot function with too little energy</p> <p>-Asphyxiation: absence of oxygen to sustain endogenous energy conversion, which causes essential cells (in brain / heart) to be damaged within minutes.</p> <p>-Possible causes: objects blocking nose / mouth / trachea; mechanical blow to the trachea; constriction of the trachea; lung obstruction; water in lungs (drowning); lung congestion (endogenous fluids as in pnueмония / congestive heart failure)</p>

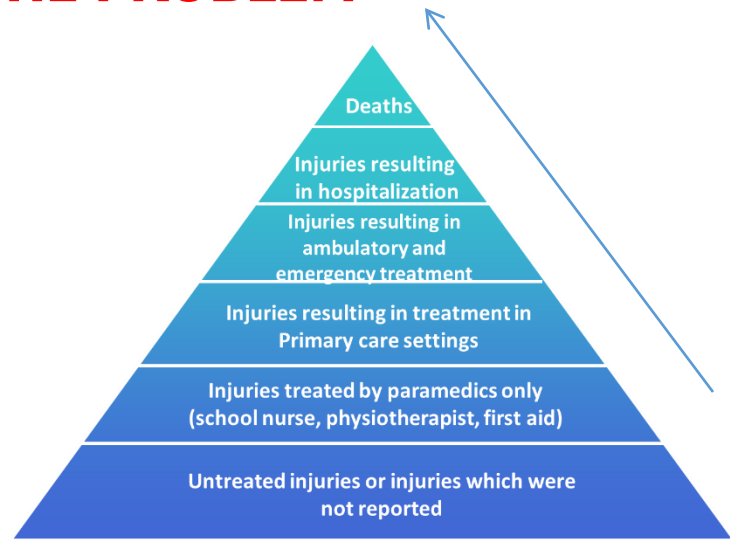


- Combustion needs fuel, O2 and heat.
- Exhaust means a place to go out (like an open door).
- The higher the exhaust, the lower the damage

MAGNITUDE OF THE PROBLEM

Global & Regional Burden:

- 12% of global burden of disease
- More than 90% of injury deaths occur in low- and middle-income countries (because the don't practice safety procedures).
- Leading causes of morbidity and mortality burden in Eastern Mediterranean Region***
- Road traffic "incidents" are the leading cause of injury deaths worldwide, which strongly applies to GCC/KSA



Injury deaths rise in rank

Leading causes of death, 2004 and 2030 compared.

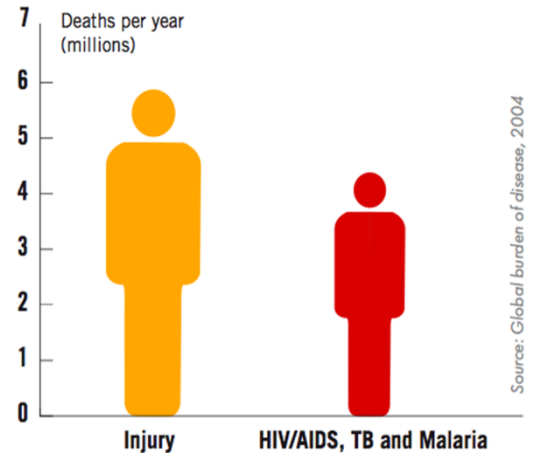
Total 2004	Total 2030
1 Ischaemic heart disease	1 Ischaemic heart disease
2 Cerebrovascular disease	2 Cerebrovascular disease
3 Lower respiratory infections	3 Chronic obstructive pulmonary disease
4 Chronic obstructive pulmonary disease	4 Lower respiratory infections
5 Diarrhoeal diseases	5 Road traffic crashes
6 HIV/AIDS	6 Trachea, bronchus, lung cancers
7 Tuberculosis	7 Diabetes mellitus
8 Trachea, bronchus, lung cancers	8 Hypertensive heart disease
9 Road traffic crashes	9 Stomach cancer
10 Prematurity and low birth weight	10 HIV/AIDS
11 Neonatal infections and other	11 Nephritis and nephrosis
12 Diabetes mellitus	12 Suicide
13 Malaria	13 Liver cancer
14 Hypertensive heart disease	14 Colon and rectum cancer
15 Birth asphyxia and birth trauma	15 Oesophagus cancer
16 Suicide	16 Homicide
17 Stomach cancer	17 Alzheimer and other dementias
18 Cirrhosis of the liver	18 Cirrhosis of the liver
19 Nephritis and nephrosis	19 Breast cancer
20 Colon and rectum cancers	20 Tuberculosis
22 Homicide	

Source: World health statistics 2008 (www.who.int/whosis/whostat/2008/en/index.html)

The injury-related deaths are expected to INCREASE by 2030

The scale of the problem

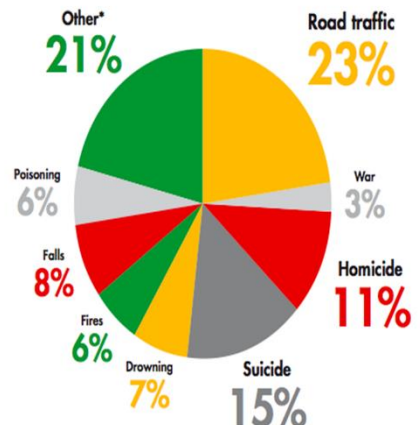
Injury deaths compared to other leading causes of mortality.



Source: Global burden of disease, 2004

How injuries claim lives

Causes of injury deaths, World, 2004.



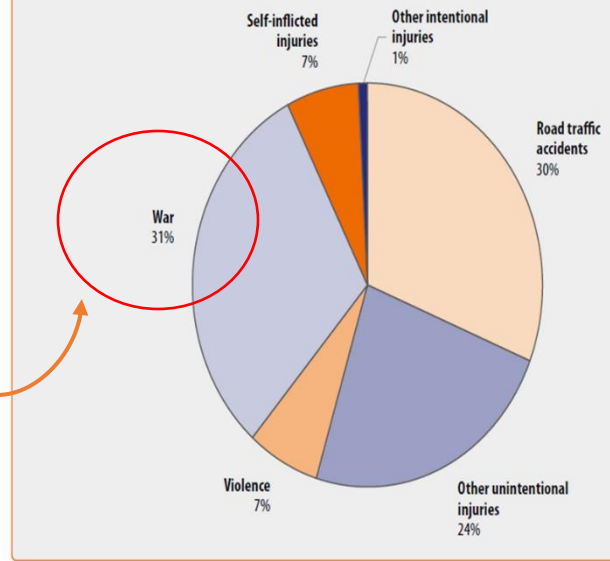
Source: Global burden of disease, 2004

Its impact on global rate of death is higher than the effect of HIV, TB and malaria combined. (imp to know causes of death)

“Road traffic accidents are a major health hazard in Saudi Arabia, and a major cause of injury”.

***The leading cause of morbidity in Eastern Meditarian Is War

Figure 10: Causes of injury deaths among men aged 15–59 years, Eastern Mediterranean Region, 2004



Types of Data & Potential Sources of Information



Mortality

- Death certificates
- Reports from mortuaries



Morbidity and Health-related

- Hospitals
- Medical records



Self Reported

- Surveys
- Media (biased)



Community-based

- Demographic records
- Local government records



Law enforcement

- Police records
- Prison records



Economic-social

- Institutional or agency records
- Special studies

PREVENTION & CONTROL

- LEVELS & CONCEPTS

- **Primary prevention:** raising awareness of the community (about first aid), at its different levels, as to methods of avoiding injuries. This includes health promotion / health education activities and applying preventive measures accordingly, **Laws and regulations**.
- **Secondary prevention:** early detection, proper evaluation and management of injuries at different levels of healthcare delivery (primary, secondary and tertiary facilities). Includes **fire-exits, fire-extinguishers, checking car engine..etc.**
- **Tertiary prevention:** management of complications of injuries, especially disabilities, including rehabilitative measures and approaches, improvement of quality of life of injury victims, as well as palliative care, when needed

- KSA EFFORTS

- **Injury and accidents prevention program, which includes:**
 - Surveillance System
 - Education
 - Capacity Building



APPLICATION TO ROAD TRAFFIC INCIDENTS

Host: victim: e.g. driver, passenger, pedestrian, etc

Agent: mechanical / thermal energy

Environment: vehicle(s) of incident

Primary prevention	Secondary prevention	Tertiary prevention
Raising awareness of the community, at its different levels, as to methods of avoiding RTI. This includes legislations, health promotion activities and applying preventive measures (seat-belts, child restraints, air-bags, good roads, following traffic rules, etc	early detection, proper evaluation and management of RTI at different levels of healthcare delivery (especially tertiary facilities: e.g. emergency / trauma facilities and related services)	management of complications of RTI, especially disabilities, on medical / social / economic levels, including rehabilitative and physiotherapy measures

“Prevention is the Vaccine for the Disease of Injury”

Summary

- ❖ **Injury is incidental while the violence is intentional.**
- ❖ **The epidemiological triad of injuries includes Host, Agent and Environment.**

- ❖ **Nature of injury:** 1-Mechanical
2-Thermal/chemical 3-Electrical 4-Asphyxiation

- ❖ **Road traffic “incidents” are the leading cause of injury deaths worldwide.**

- ❖ **Types of Data & Potential Sources of Information:**
 - Mortality: Death certificates & Reports from mortuaries.
 - Morbidity and Health-related: Hospitals & Medical records
 - Self Reported: Surveys & Media
 - Community-based: Demographic records & Local governmental records.
 - Law enforcement: Police records & Prison records
 - Economic-social: Institutional or agency records & Special studies.

Prevention:

1-Primary: raising awareness

2-Secondary: early detection, proper evaluation and management of injuries.

3-tertiary: management of complications.

MCQs

These are the quiz questions

- 1- **The first leading cause of morbidity and mortality in the East Mediterranean region is:**
 - A- RTA
 - B- Wars
 - C- Fires
 - D- Electricity

- 2- **The most common cause of injury in KSA is:**
 - A- RTA
 - B- Wars
 - C- Fires
 - D- Electricity

- 3- **The effect of fire on causing injury is influenced by:**
 - A- Size of combustion
 - B- Oxygen conc.
 - C- Types of heat source
 - D- All of the above

- 4- **Which is true about the global burden of injury:**
 - A- Most of injury-related deaths occur in developed countries
 - B- Its impact on global rate of death is higher than the effect of HIV, TB and malaria combined.
 - C- The most common cause of injury globally is war.
 - D- The proportion of deaths due to RTAs is estimated to decrease by 2030

- 5- **Which of the following is considered a tertiary prevention method of injury:**
 - A- Health education
 - B- Traffic regulation laws
 - C- Early detection
 - D- Rehabilitation of injured cases

- 6- **What is true about injury?**
 - A- It is a chronic exposure to an agent.
 - B- It can be caused by a sudden lack to an essential agent.
 - C- It is always accidental.
 - E- the magnitude of an agent's effect doesn't have to exceed the human tolerance threshold for an injury to occur.

- 7- What is true about magnitude of injury in a population?**
- A- Majority of injury cases are hospitalized.
 - B- Majority of injury cases are not reported.
 - C- Minority of injury cases are not reported.
 - E- All of injuries lead to death.
- 8- Which of the following is considered as a secondary prevention method of injury?**
- A- Health education.
 - B- Traffic regulations enforcement laws
 - C- Early detection of cases.
 - D- Rehabilitation of injured cases.

Answers:

B – A – D – B – D – B – B – C

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