

MODULE

Injury Prevention and Management

For the Ethiopian Health Center Team



Melkie Edris, Getu Degu, Cherent Bahru, Gashaw Messele, Baye Gelaw,
Abebaw Erdie, Takele Tadesse, Zeki Abdurahman, Mamo Wubshet

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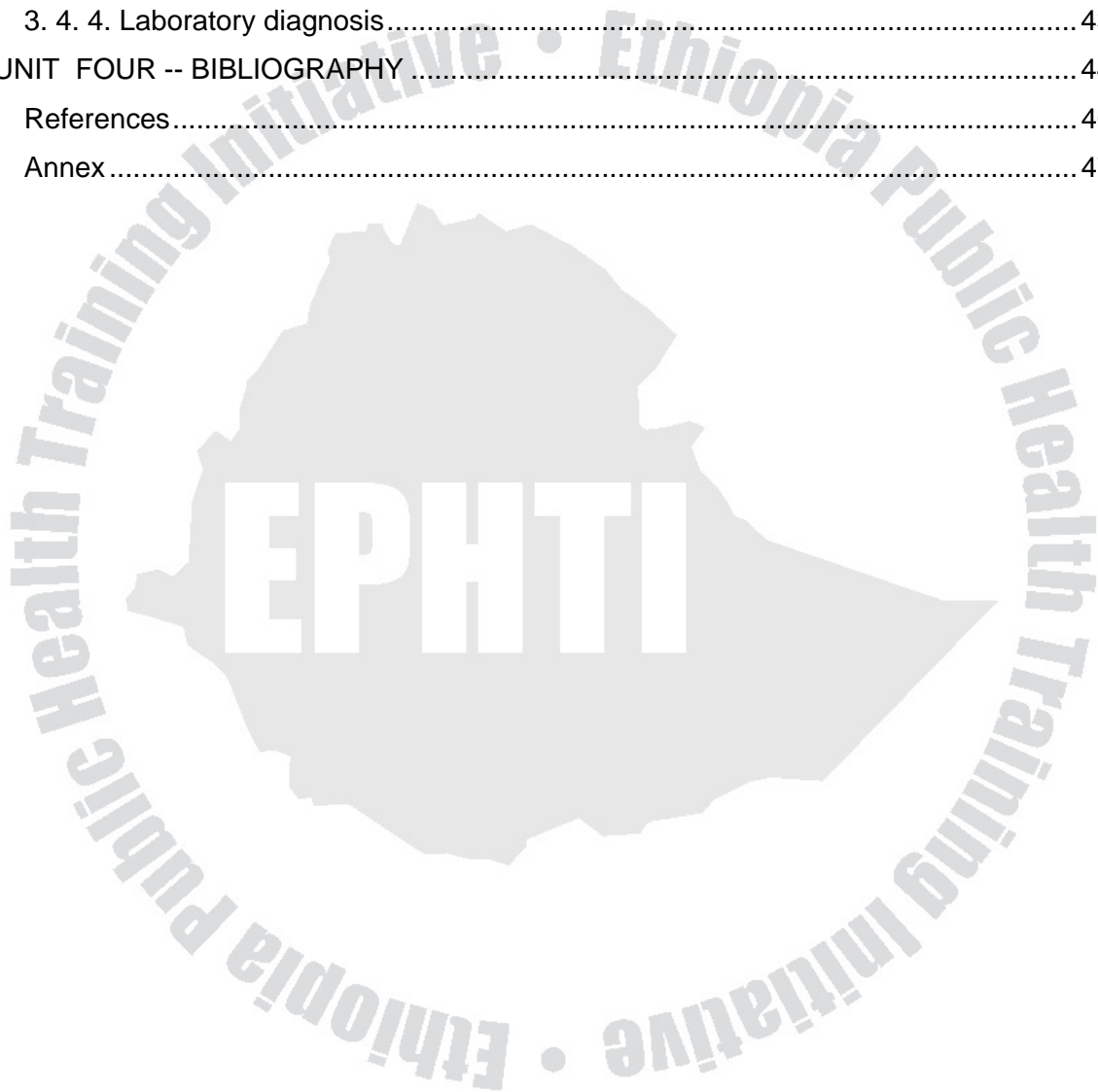
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UNIT ONE

INTRODUCTION

1. 1. Purposes and uses of the module

Injuries are major health problems that commonly appear on the morbidity and mortality reports of the health institutions in Ethiopia. Despite this prevailing phenomenon, limited attention has been given to injuries as health problems.

It is true that the Ethiopian National Health Policy has given attention to the prevention and management of injuries. However, this golden principle has not been implemented to the extent that it brings a significant change in the reduction of morbidity and mortality from injuries.

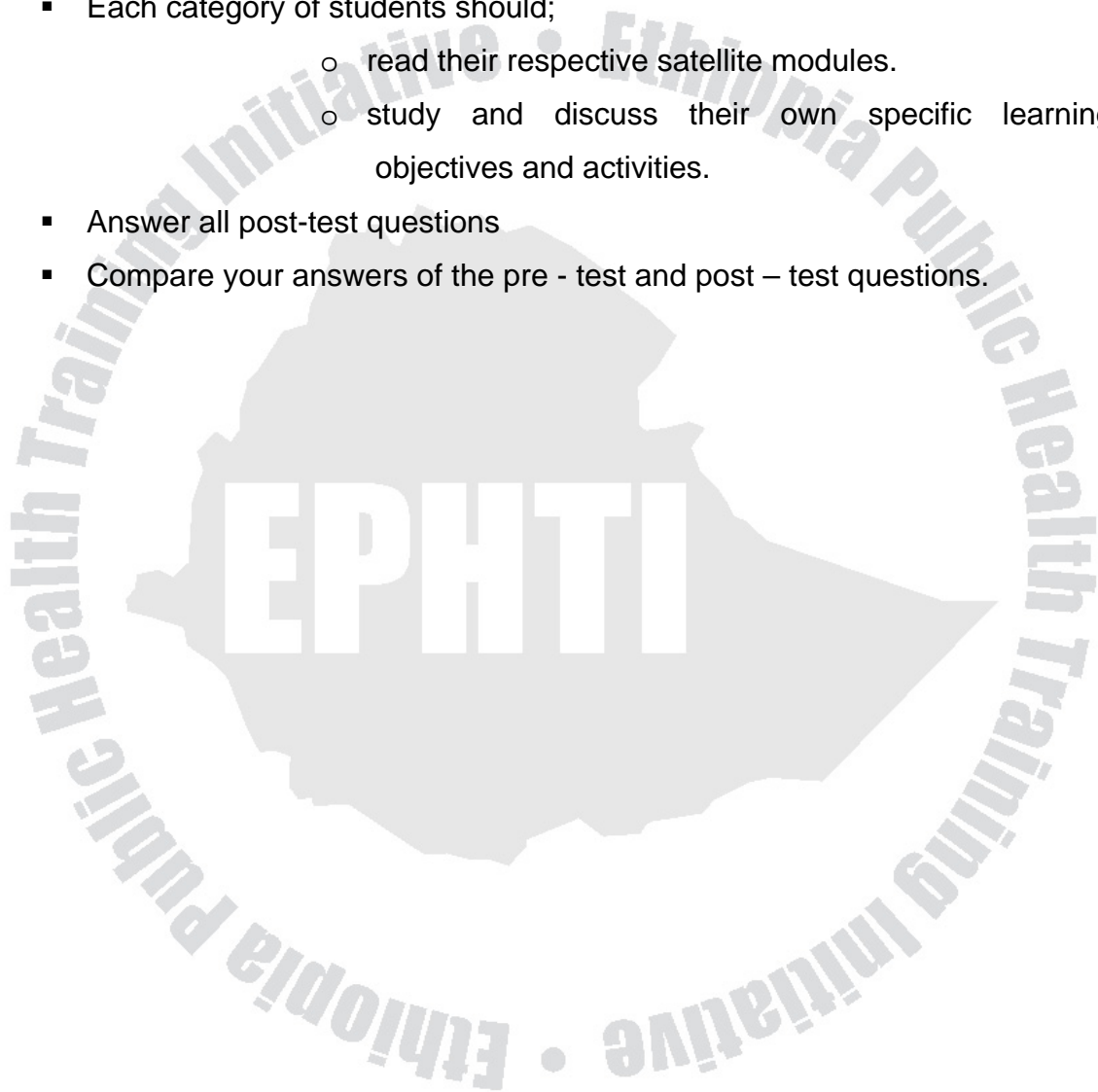
A number of factors are usually involved in the low performance towards the prevention and management of injuries. Some of these factors are:

- Inadequate community involvement mainly due to lack of awareness.
- Poor intersectoral approach.
- Shortage of trained health personnel.
- Lack of appropriate materials on accident and injury prevention and management
- Cultural issues

To bring a significant change in the reduction of mortality and morbidity due to injuries, the presence of trained health personnel and the availability of appropriate teaching materials (modules) are mandatory. Therefore, this module is expected to fill the gap and facilitate the activities of the health center team.

1. 2. Directions for using the module

- Attempt all the pre - test questions.
- Go through the core module and ensure that you have understood the epidemiology, predisposing factors, causes, preventive and management aspects of injuries.
- Each category of students should;
 - read their respective satellite modules.
 - study and discuss their own specific learning objectives and activities.
- Answer all post-test questions
- Compare your answers of the pre - test and post – test questions.



UNIT TWO

CORE MODULE

2. 1. Pre-test

1. The epidemiology of injuries refers to:
 - a) The distribution of injuries by place, person and time.
 - b) The study of the determinant (predisposing) factors.
 - c) The application of research results in their prevention and management.
 - d) All of the above

2. Which of the following is not true about injuries?
 - a) World-wide injuries ranks 5th among the leading causes of death
 - b) Demographic changes have effects on the epidemiology of injury
 - c) The problem of injuries is much higher in the developed countries than in the developing ones.
 - d) The estimated mortality from injuries and poisonings in sub-Saharan Africa is much higher for males than for females.

3. All of the following are direct causes of physical injury, except:
 - a) Ignorance
 - b) Road traffic accident
 - c) Fall
 - d) Drowning
 - e) Fire

4. The most important functional systems of the body, which must be, considered during resuscitation of an injured patient are:
 - a. Respiratory, Circulatory, Nervous
 - b. Respiratory, Circulatory, Digestive

- c. Circulatory, Excretory, Digestive
 - d. Nervous, Endocrine, Respiratory
 - e. All systems are exclusively important
5. Poisons (chemicals) cause injuries if:
- a) Inhaled
 - b) Applied to the skin
 - c) Swallowed
 - d) Injected
 - e) All of the above
6. Which of the following is not decisive in the management of an injured patient at a health center
- a. Team organisation
 - b. Proper transportation and communication system
 - c. Presence of an intensive care unit
 - d. Presence of basic (routine) laboratory service
 - e. None of the above
7. Which of the following statements are correct about the predisposing factors for injury?
- a. Excessive alcohol intake predisposes to unsafe driving and injuries
 - b. Mentally ill are less frequently exposed to injuries than healthy individuals
 - c. All injuries arise from lack of awareness and information
 - d. Poor socio-economic status is associated with infrequent injuries, because of limited access to high technologies
 - e. All
8. Choose the wrong statement.
- a. The young and the elderly are affected most from injuries due to falls.

- b. Females are not as frequently affected as males in homicidal injuries
 - c. The mechanism by which the injury is produced affects the treatment
 - d. The role of prevention in some physical causes of injury is minimal
 - e. None
9. The wrong statement in the general approach of a patient who is severely injured is:
- a. Organisation and team approach is necessary
 - b. Priority should be given to treatment of shock before anything else.
 - c. The arrest of bleeding can be done by tourniquet if other simple methods fail
 - d. The mainstay of treatment of burn is fluid administration if the surface area of burn injury is greater than 10%
 - e. None

2. 2. Definition and Epidemiology of injuries

2. 2. 1. Definition

- a) **Accident** is a sudden unexpected occurrence leading to injury or trauma.
- b) **Injury** or **trauma** is tissue damage resulting from a transfer of different forms of energy either intentionally or unintentionally.

2. 2. 2. Epidemiology

Worldwide, injury ranks fifth among the leading causes of death, accounting for 5.2 percent of the total mortality (Manciaux and Romer, 1986) and 10 to 30 percent of all hospital admissions (WHO, 1988). Nearly 3 million deaths of injury and poisoning are reported annually; two-thirds of these occur in the developing countries (WHO, 1989).

The annual medical and social costs of injury are estimated to exceed \$500 billion world wide (WHO, 1989).

Observation of trends in the epidemiology of injury in developing countries raises the question of the relationship between development and injury. Omran (1971) pointed out that developing countries move through an “epidemiological transition,” from a disease profile dominated by infectious diseases to one characterised by the “post-transition” non-communicable health problems, including injuries. The global health burden of injuries in the year 2020 is projected to be equal to that of communicable diseases, and even greater in some developing countries.

Demographic changes (such as the shift in age structure and urbanisation) have had effects on the epidemiology of injury primarily through an increase in the incidence of injuries, which are more prevalent among the elderly (such as falls) and in urban environments (such as motor vehicle accident).

The incidence of moderate to severe burn injury is probably at least 600 per 100,000 people in developing countries. The occurrence of new injuries from falls in developing countries is probably at least 2,000 per 100,000. The average age of 30 years at the time of injury reflects the higher incidence among the elderly and the occupational nature of many of these injuries.

The incidence of all injuries due to motor vehicle accident in developing countries is likely to be at least 665 per 100,000. The average age of thirty years at the time of injury reflects the fact that persons injured in motor vehicle accident in developing countries are older than their counterparts in the industrial world (PAHO, 1986).

The estimated mortality rate from injury and poisoning in Sub – Saharan Africa is much higher for males than females. For example, the mortality rates for males for the years 1985, 2000 and 2015 were estimated to be 138, 129 and 123 per 100,000 persons respectively. For the years given above, the estimated mortality rates for females were 32, 32 and 31 per 100,000 persons respectively.

Although the impact is less well understood, injury is one of the leading causes of adult mortality and a major contributor to disability in most age groups in many low- income countries such as those in Africa. This is especially true in countries that experienced recent increases in industrialization and motorization. Despite this, limited attention has been paid to injury as a health problem. Comprehensive epidemiological information on injury incidence, severity, risk groups and risk factors is essential for setting intervention priorities and preventive policies. Development of these effective efforts depends on reliable, detailed information on the incidence and outcome of specific mechanisms of injury. However, in developing countries, such sources of data are limited. Many injury related deaths are not reported, while most injured persons do not receive formal medical care, making health care records an incomplete source of data.

The epidemiology of injuries in Ethiopia is similarly poorly documented with scarce regional data and un-established programs for surveillance and prevention. The problem is higher in Ethiopia due to unsafe technology and working conditions. The prevalence of injuries in specific factories due to machineries and hand tools was found to be 18% and 12% respectively. Furthermore, like other developing countries, most of the working forces in Ethiopia are employed in informal sectors such as carpentry, masonry, garages, tannery, pottery, etc, which have high levels of injuries due to unsafe working condition and environment.

In a study conducted in the North Gondar administrative zone, Northwest Ethiopia, the leading cause of injuries was assault (48.5%) followed by falls (18.6%) and then road traffic injuries (14.7%).

Therefore, the health center team should have a clear understanding of the epidemiology of injuries in order to design appropriate preventive (control) strategies and manage injured cases. It is also of paramount importance for the health center team to understand the necessity of proper documentation and timely reporting of injuries and the measures taken to tackle such problems.

2. 3. Predisposing Factors

Accidents happen in conditions and on individuals prone to injuries. The Presence of predisposing factors promotes injuries to happen. The health center team thus is expected to know some of these conditions.

- a) **Excessive alcohol intake and addictions of any kind:-** reduces the concentration and motor control of individuals. It is particularly associated with road traffic injuries, homicidal and criminal acts. These predispositions are avoidable.
- b) **Mental illness:-** mentally ill people can have self-inflicted injuries or cause injuries to others. For example seizure patients may suffer fits in a site close to fire and sustain fall or burn injuries. Also they may be eating food and choke get.
- c) **Lack of knowledge or information:-** Information regarding safety measures about use of sharp instruments, irritants and electric systems, firearms and explosives are necessary. Failure to have adequate knowledge and information about all these measures predisposes to injuries.

Good knowledge of traffic rules and regulations save lives that could be lost due to road traffic injuries.

d) **Negligence and Carelessness:** - there are some jobs which demand absolute concentration and attention, otherwise leading to injuries.

For example:

- Machine operating, driving
- Electrical system or line maintenance
- Cooking

e) **Lack of precautionary measures:** - appropriate use of precautionary measures such as eye goggles and fire-protecting jackets prevent injuries.

f) **Defective Appliances:-** such as leaking gas valves, inefficient maintenance of machines, inappropriate storage of poisons, flammables, etc. cause injuries.

g) **At careless approach** to animals results in animal bites, stings, horn injuries, etc.

h) **Age and sex:** younger age individuals and adolescents are at risk of injuries caused by alcohol induced violence and road traffic injuries by virtue of their behavior. Females are more exposed to burn injuries, rapes and assaults from male counter parts.

i) **Socio-economic status:** poor socio-economic conditions are associated with pedestrian injuries, assaults and burns.

j) **Occupation:-**

- Workers who work in:

- Areas with Heavy metals: (e.g. Mercury, lead, etc) recurrent stomach pain in a worker involved in deleading.

- Grinders and operators of chain saws, hammer and other tools are exposed to segmental vibration, which affect the upper limbs
- Health professionals
 - in advertent infection during working times.

2. 4. Common Causes

The mechanism by which accidents happen is long-listed. However, based on epidemiological data on injury in our country and data from other African countries of similar settings, the following causes are identified:

2. 4. 1. Physical causes

1. Personal assault/ homicidal injuries

These types of injuries are commonly intentional in the event of producing an injury to another person. Many things can be used to cause injury: throwing objects such as sticks or stones; using parts of the body and knives.

2. *Road traffic injuries:* - play a major role as a cause of death in towns and cities. Studies have shown that proper application of driving rules reduces injuries. Mixed traffic systems where by vehicles, animals, and pedestrians share the roads, is one of the major causes of road traffic injuries. Unsafe roads, old vehicles, lack of safety knowledge, and lack of driving skills all contribute to road traffic injuries.

3. *Falls* may occur in daily activities of individuals. All age groups may be affected. However, most falls result in injury when they occur in either the young or old ages. Falls from trees while trying to harvest fruits is an example. Walking on uneven roads may cause falls in the young or old who may not have a steady and strong gait.

4. *Bullet injuries:* - occurs both in war and peace. It can be homicidal, unintentional, suicidal, or genocidal in origin. It is one of the leading causes of injuries in our country.

5. *Sexual assaults (Rapes)* :- produces both physical and psychological trauma; the psychological trauma may be more disabling than the physical trauma and may be harder to detect.
6. *Mishandling* of sharp objects, machineries, weapons, explosives etc.
7. *Drowning*: - can occur during flooding, when trying to cross a flooded river, swimming, infants may drown in small tubes of water if left unattended.
8. *Choking/aspirations*: - this may happen to occur while eating food. Children playing with coins may aspirate or swallow the coin, which may result in choking.

2. 4. 2. Burn and electrical injuries

Burns are accidental injuries known to mankind since ancient times. It is caused by exposure to extreme heat from open fire, hot liquids, very hot surfaces or steam. Electrical injuries also produce burns. When a high voltage current passing across the tissue, it encounters resistance and heat will be generated resulting in tissue injury.

2. 4. 3. Chemical injuries: - exposure to harmful chemicals such as strong acids or alkaline damages tissue. Chemicals used by the traditional healers may also cause tissue injury. The magnitude of local industry and agricultural practices determines the prevalence of chemical injuries.

Table 1. Pathological outcomes commonly associated with injury events in the developing world.

Injury event	Type of injury
Fire	Burn & thermal injury
Electric shock	Burn and thermal injury
RTA	Crush and deceleration injury, abrasion and laceration, dislocation and fracture
Fall	Crush and deceleration injury, abrasion and laceration, dislocation and fracture
Drowning	Anoxic injury
Poisoning	Chemical injury

2.4.4. Radiation exposure: - rare cause of injury in developing countries.

2. 5. Prevention of common injuries

Prevention of injuries is an essential part of primary health care. Treatment is relatively expensive, often lingering and not always successful in preventing permanent disability. It is therefore, essential to strengthen the efforts of injury prevention.

In making plans for the prevention of injuries, it is useful to consider the following activities.

Primary Prevention

- Information, education and communication on injury prevention and control
- Machines, tools and equipment should conform to national safety standards
- Use less hazardous pesticides such as those based on pyrethrums, which are considered to be less toxic to humans, than some other pesticides.

- Keep covered hazardous substances.
- Use personal protective devices such as safety goggles, face shield, gloves, helmet, dust masks, protective suits and safety shoes.
- Control conditions likely to cause fire or promote spread.
- Provide adequate emergency facilities for escape in case of fires.
- Protect danger of electric shocks in which proper electric wiring is essential, such as proper installation of sockets, insulation of electric wires using conduits
- Protect gas poisoning which calls for proper ventilation or venting of the room to dilute the indoor air.
- Protect falls and other mechanical injuries in the house through proper home management. (Such as eliminating tripping hazards)
- Protect people against the hazards of automobile traffic by providing road safety measures, seat belts for all passengers, avoiding alcohol and overloading of vehicles when driving.
- Educate the public on prevention of injuries.
- Use legislation and regulation to improve occupational, construction and transportation safety.
- Strengthen the rehabilitative services at the community level and referral resources at secondary and tertiary levels.
- Capacity building in injury registration at the national level.
- Data planning is necessary.

Secondary prevention: prevention of further damage after a trauma has occurred.

Tertiary prevention: prevention of serious complications of trauma and disability.

2. 6. General approach to the injured patient

Injuries may range from located minor trauma to life-threatening severe trauma affecting multiple systems in the body (e.g. nervous, circulatory etc). Injured

patients or mass casualty can arrive at health institutions any time; therefore, the health centre team needs to have a modest organizational capacity to deal with the primary care of the injured. Organization comprises adequate number of staff, protective devices such as gloves, aprons and lifesaving equipment. Principle of triage (sorting out of patients according to the severity of their injury to prioritise treatment) needs to be employed in cases of mass casualty.

The team, in order to handle injuries, must understand the following general approach (the ABC's of trauma care).

A. *Airway*: It is easily obstructed by the tongue falling in back to the throat in an unconscious patient. It can also be obstructed by foreign bodies in the pharynx or larynx. Putting the patient in semi-prone position and lifting of the chin prevents the tongue from obstructing the airway. This opens the mouth and makes the removal of a foreign body easier.

B. *Breathing difficulty*: - it is usually from rib fractures, (single or multiple) that can be treated by analgesics. Breathing problems can also arise from (hemothorax) and tension pneumothorax. Immediate chest tube insertion should be done if there is any doubt about the presence of pleural space collection.

C. *Circulation*: bleeding kind/or a circulatory collapse is a clinical condition, which accompanies trauma. Any external bleeding has to be stopped. Simple pressure application or dressing stops the majority of bleeding. Profuse bleeding from a ruptured major vessel of a limb can be stopped temporarily by a tourniquet

Following trauma patients may bleed internally. In such conditions their will be:

Altered mentation.

Vital sign changes, BP decreased and PR increased

Patients in shock presents with the following signs and symptoms - sweating, restlessness, cold and clammy extremities.

Therefore wide bore IV line should be opened and resuscitation started with normal saline (N/S) or Ringer's lactate (R/L)

2. 6.1. CARDIO-PULMUNORY RESUSCITATION (CPR)

- Is a technique of providing external cardiac massage and artificial ventilation. It is employed for any patient who has just stopped breathing, has a gasping type of breathing or has no cardiac activity.
- It is performed by applying five chest compressions followed by one artificial ventilation (either by ambou bag, mouth – to – mouth or mouth – to – nose) until cardiopulmonary function resumes or death is confirmed.
- Neurological assessment: - A quick assessment of the level of consciousness using Glasgow coma scale (eye opening verbal response and motor function) gives some idea about the conscious level.
- Transportation of an injured patient should be done very carefully taking care of the airways fractured limbs and especially if spinal injury is suspected or confirmed. When spinal injury is suspected the patient is transported without moving the spine by at least 8 people 4 on each side. This prevents further injury to spinal cord.

2. 6. 2. WOUNDS

There are two kinds of wounds: Open and closed. Open wounds are treated based on the site, size and degree of contamination and the mechanism by which they are produced.

- Abrasions, bruises and punctures are treated by wound cleaning with antiseptics and dressings.
- Simple lacerations need cleaning, disinfection and primary closure by suturing if less than 72 hrs from time of injury.

- Contaminated and rugged wounds are treated best with wound toileting (washing) with disinfectants and saline. The wound is left unsutured for delayed primary or secondary closure.
- Extensive wounds with necrotic tissue are treated by removing necrotic tissues or any foreign bodies (done best at a hospital setting) and close by secondary closure.
- Do not close primarily animal and human bite wounds; consider antirabies prophylaxis in suspected cases.
- Do not primarily close bullet injuries regardless of wound size.
- Splint and immobilize extensive soft tissue injuries to relieve pain and facilitate wound healing.

Tetanus Prophylaxis: -

Tetanus toxoid is an active prophylaxis, which prevents tetanus; therefore, it should be given following open wounds. Tetanus anti-toxin is an immunoglobulin, which gives passive protection against tetanus. It should be given as soon as possible for all wounds except clean lacerations, which are not contaminated.

Analgesia: - all injuries produce pain, which may compound the condition by neurogenic shock. Therefore adequate oral/parenteral analgesia is required in most patients

Antibiotics:- Are administered only when indicated. Mass or rigorous antibiotic administration is harmful and must be avoided.

Soft tissue injuries without open wound: - include concussions, contusions and hematomas. These are treated with analgesics and splinting if necessary, cold or hot compression, and may need further work up.

2. 6. 3 Poisoning

Is the application of harmful substances to the body whether applied externally or internally.

- Sign and symptoms of poisoning
 - Sudden onset of pain or illness
 - Burns around the lips or mouth
 - Peculiar breath odour
 - Vital sign derangement
 - Pupillary size changes (meiosis)
- Management of acutely poisoned patient primarily aims at supporting vital functions (air way, breathing, circulation)
- All patients who need hospital care are referred when all preconditions are fulfilled: first aid given, appropriate positioning, splinting and can be safely transported with an accompanying health worker. Initial communication with the receiving institution should be made.
- Complications
 - Infection, sepsis, embolism
 - Multiple organ system failure
 - Shock lung (Adult respiratory distress syndrome)
 - Compartment syndrome
 - Gangrene
 - Loss of a body part

2. 7. Learning activities

Case study - 1

A 30 year old male was involved in road traffic injury. He has sustained injury to the head and neck, has bleeding from nose and ear and is lethargic but has no vomiting or loss of motor function. On examination the BP is 100/80-mmHg and pulse rate of 80/min, there are lacerations on the head. Examination of systems revealed no abnormality. Using the given information:

- A) Explain the evaluation of the consciousness level of the patient.
- B) How do you treat the wound on the head?
- C) How do you assess the degree of blood loss?
- D) What further actions do you consider?

Case study - 2

Ato Belachew was found lying unconscious and was brought to health center by friends. No body in the village knows what happened to him but on preliminary examination, he has large wounds on the chest and abdomen.

- A] Describe the management of airway and circulation
- B] How do you evaluate the wound?
- C] Discuss the treatment of wound and prevention of potential infection
- D] How do you make an early and safe referral?

Case study - 3

A 16 year old boy fell from a tree of 4 meters high while harvesting “Wanza” fruit. He has bleeding and pain in the lower leg region and noticed swelling and deformity.

- A] Discuss the initial management of the patient.
- B] Assess the extent of external bleeding.
- C] Assess for presence of fracture and dislocation.
- D] Describe methods of arresting bleeding.
- E] Discuss the methods of splinting, analgesia and referral

Case study - 4

A 25 year old, previously healthy person who works on malaria control, became unconscious after a daily activity of insecticide spraying

- A] What do you think happened to this man?
- B] What possible care do you give at your level?
- C] What other options do you have?

UNIT THREE

SATELLITE MODULES

3.1 Satellite module for health officer students on Injury Prevention and Management

3.1.1. Introduction

Management of injuries is an essential part of primary health care and the majority of trauma cases can be handled by midlevel health workers.

The module presents case studies, which are believed to illustrate the learning objectives below. The health officer has already the basic knowledge about the various clinical features of injuries and is the leader in the management of the injured. The team needs to have good coordination among its members. Members should be encouraged to actively play their role in the teams endeavour. The goal of this module is to emphasize the role of the health officer in the health center team.

3.1.2. Learning objectives:

At the end of this course the student will be able to:

- Coordinate the health center team on general approach of injured patient
- Treat wounds and soft tissue injuries
- Diagnose and treat fractures
- Assess and evaluate injuries to the head, chest, abdomen, and extremities.
- Identify those who require referral to higher-level health institutions at the appropriate time. (When transportable).

3. 1. 3. Injury patterns and some commonly encountered injuries

3. 1. 3. 1. Patterns of injured patients

- a) Severely injured patients who die at the trauma scene.
- b) Severely injured patients who may die after few minutes of arrival at the hospital.
- c) Injured patients who may die hours to days after hospitalisation.
- d) Injured patients who need hospital treatment but are not at danger of death
- e) Patient with minor injuries

3. 1. 3. 2 Specific and common injuries

1. Chest injuries

- Are the leading cause of trauma death
 - Most are due to blunt injuries (e.g. road traffic trauma).
 - Many patients have associated injuries to the head and the abdomen, hence careful evaluation of these systems is important.
 - Chest injuries may result in a:
 - Simple rib fracture
 - Flail chest
 - Pneumothorax (simple or tension pneumothorax)
 - Hemothorax
 - Lung contusion
 - Cardiac tamponade.
- **Patient evaluation**
- History – ask about the mechanism of injury, chest pain, dyspnea, and symptoms of associated injuries (e.g. abdominal pain).
 - Physical examination – look for tachypnea, Hypotension, bruises, external wounds, abnormal chest wall movement, tenderness,

subcutaneous emphysema, (hyper-resonance), dullness and asymmetry of air entry to the lungs.

- Chest X-ray (patients with unstable vital signs should not be sent for x-ray).

➤ **Treatment-**

1. Sealing of open and sucking chest wounds
2. Adequate pain relief.
3. Evacuation of any pleural collection (air/blood) by inserting chest tube.
4. Pulmonary physiotherapy.

Case study

A 27 year old male has been run over by a motor vehicle with a speed of 80 km/hr. The relatives brought the victim to the health center. On preliminary examination he was found to be conscious, but restless. There were bruises and tenderness on the left side of upper chest and lower abdomen.

Based on the above information, answer the following questions.

1. Discuss the relevant further physical examinations needed to be done.
2. What do you think could be the reasons for his restlessness and how can these be treated?
3. The presence of abrasions on the upper chest may be a clue to injuries of:
 - a.
 - b.
 - c.

4. The tenderness on the left upper abdomen may be due to Injuries of:
 - a.
 - b.
5. Describe the treatment of chest injuries
6. What are the basic principle of diagnosis and treatment of abdominal injuries?
7. Outline the basic laboratory and X-ray investigations relevant to the condition
8. On the 3rd day of trauma, the victim developed abdominal Distension, tachycardia and became febrile
 - What likely complication did this patient develop
 - What can you do in a serious complication like this?
9. Was this injury preventable? Explain

2. Abdominal injuries

Types

1. Blunt abdominal injury
 - may be due to road traffic injuries, fall, or Kicks from people or animals.
 - solid intrabdominal organs like spleen and liver are injured mostly causing intra-abdominal bleeding
2. Penetrating abdominal injury
 - May be due to bullets, blast fragments or knife stabs.
 - The small intestine is the most frequently injured organ and often results in peritonitis.

Patient evaluation

History: - ask about the mechanism of injury, abdominal pain, vomiting, bowel motion and rectal bleeding.

Physical exam: - check for tachycardia, hypotension, pallor, bruises, abdominal distension, tenderness, rigidity and shifting dullness.

Investigation: - Hematocrit, blood grouping and x-match.
- Diagnostic peritoneal tap.
- Chest x-ray

Treatment:- all patients requiring laparotomy should immediately be referred after instituting resuscitative measures. These include all patients with:-

- Abdominal bullet and blast injuries.
- Blunt abdominal injury and signs of intra-abdominal bleeding or Peritonitis.
- Stab injuries in which there is facial penetration.

3. Head injuries

- Most are closed head injuries due to road traffic accidents, falls and homicidal assaults.

- **Pathology:**

Primary head injury – is injury occurring at the time of the impact

- It may be scalp laceration, skull fracture, brain concussion, brain contusion or brain laceration.

Secondary brain injury – injury that occurs hours or days after the incident.

- It is due to increased intracranial pressure because of brain edema or intracranial haematoma.

- Prevention and institution of early treatment of secondary brain injury is the most important point in the management of patients with head injury.

Patient evaluation

History: mechanism of injury, loss of consciousness, seizure, vomiting, bleeding through the nose or ears, symptoms of associated injuries (e.g. chest pain).

Examination:- vital signs (hypotension may indicate concealed bleeding into the chest or abdomen).

- look for tenderness, swelling, bruises and wounds to the head. Bleeding from ears or nose, subconjunctival hematoma.
- Look for associated injuries especially chest and abdominal injuries.
- The neurological examination should:
 - A) Assess the level of consciousness (using the GCS) – see annex.
 - B) Detect any lateralizing signs. (compare the power, tone and reflexes of extremities)

Investigation:- skull x-ray (anteroposterior and lateral views).

Management:

- Follow the ABC rules of trauma care.
- Suture all scalp lacerations.
- Give antibiotics for all compound skull fractures.
- Early referral is necessary for the following patients:
 - Comatous patients (GCS \leq 8)
 - Patients with deteriorating level of consciousness or a neurologic deficit.
 - Patients with associated injuries to chest or abdomen

- Patients with depressed skull fractures

Case study

A 60 year old carpenter fell from a roof which is 10 meters high while repairing an old leaking roof. Following the accident he reportedly lost consciousness immediately. On preliminary examination he opens his eyes to painful stimulation, flexes his extremities utters some incomprehensible words and the right pupil is dilated.

Based on the above information

1. What is the GCS?
2. What is the life threatening condition in this patient?
3. What does pupillary dilatation indicate?
4. How do you prevent brain edema?
5. What precautions do you take before transferring to a hospital?

4. Spinal injury

A polytrauma patient especially after road traffic and fall accidents must be considered a potential suspect for spinal injury until it is ruled out.

Clinical features - Pain and tenderness in the region of the injury

- Weakness or paralysis below the level of the injury
- Loss of bladder and bowel control

Management

- Use rules of ABC for resuscitation
- Transportation of the patient with spinal injury when stable.

Transportation and treatment of spinal injury patient

The method of transportation and treatment of a spinal injury patient differs depending on the anatomic region of injury, neurological status, stability of the injury, and general status of the patient.

Cervical spinal injury

- Keep the head of the patient flat on a stretcher
- Put sandbags or rolled –up cloth on each side of the head to support the head
- Apply cervical collar if available
- Watch for respiratory distress
- Treat other injuries

Thoracic and lumbar spinal injury

- ◆ If the patient is conscious
 - Lift patient flat on back
 - Use spinal board if available
- ◆ If the patient is unconscious
 - Take resuscitatory measures (ABC's see core module)
 - Elevate the lower limb for a short time
 - Keep the patient flat on face
 - Treat other injuries
- ◆ If available do also X-ray examination of the spine in various directions or plains (Atrerio-posterior, Lateral, Oblique, Pillar view, etc)

5. Fractures

The following must be done in-patients suspected of a fracture.

- Inspection for obvious deformity, swelling, visible bone
- Test the active and passive movements of the potentially affected joint(s)
- Localize pain
- Check for instability (abnormal movement), crepitation, circulation problems (colour changes or absence of pulse), motor dys function, sensitivity
- Laboratory investigations like Haemoglobin/Hematocrit, blood grouping and cross match

- If possible take X-rays in two planes
- ◆ **Treatment** - any fracture treatment should have the following aims.
 - a. Good bony consolidation and alignment with good functional results.
 - b. Restoration and securing of circulation, motor function and sensitivity
 - c. Prevention of further damage (e.g. infection, pressure sores, compartment syndrome etc.)

•
These aims can be realized by the following intervention measures.

- ◆ **Reduction** (if the fracture is associated with displacement)
- ◆ **Stabilization** - functional iron mobilization, external splinting (POP, Wooden splints, traction, external or internal fixation).
- ◆ **Prevention of complications** (e.g. infections, deformities, functional losses etc.)
- ◆ **Rehabilitation** - exercise to regain normal function

Treatment of closed fractures - this includes reduction, stabilization and rehabilitation (primary elevation of the injured limb, continuous control of circulation, motor function and sensitivity, early pain free exercises as soon as period of swelling is over). In this the role of a health officer will be a temporary functional immobilization and external splinting until the patient reaches a hospital to get proper orthopedic services.

General principles of open fracture treatment

1. Reduction (for displaced fractures)
2. Stabilisation or immobilization using splints and tractions
3. Wound management
4. Rehabilitation

6. Burn injuries

A burn is a tissue injury due to thermal or chemical application

Types:- flame burn

- Scalding
- Chemical burn
- Electrical burn

Pathology:

A burn victim loses the effective circulatory volume due to evaporation from the burn surface, exudation of fluid into the interstitial space and systemic vasodilatation.

The severity of burn is a function of the burn depth (degree) and the extent (percentage) of burn area.

The extent (percentage) of burn is estimated by the “rule of 9” and determines the amount of fluid necessary for resuscitation.

Classification according to the degree of burn

- A. 1st degree burn – involves the epidermis only; no blisters; painful
- B. 2nd degree burn – involves part of dermis and epidermis; blisters; painful.
- C. 3rd degree burn – involves all of the dermis and possibly underlying tissues; painless due to nerve destruction.

Management

1. Resuscitation

- follow the ABC rules of trauma
- all adults with burn $\geq 20\%$ and children $\geq 10\%$ of body surface area (BSA) need admission and IV fluid administration.
- Amount of fluid needed for the first 24 hour = 4ml/kg of body weight/ % of BSA burnt plus daily maintenance.

(half of the calculated amount is given in 1st 8 hours and remaining half in the next 16 hrs).

- The fluid should be a saline containing one. (e.g. Ringer's Lactate, normal saline or dextrose in saline).

2. The burn wound should be cleaned with antiseptics and a
 - topical antimicrobial is applied e.g. 1% silver sulfadiazine.
3. Analgesics should be given to control pain adequately.
4. Tetanus prophylaxis
5. Antibiotics are given if there are signs of infection and in burn >30% prophylactically.
6. Escharotomy should be done for circumferential burn of limbs, neck and chest.
7. Prevention of contractures – by encouraging exercise of all joints.

Prevention – see core module

Case study

A 15 year old housemaid, while cooking on butagas, the kitchen caught fire and she sustained burn injury to the face, front of the trunk and right leg. She is in agonizing pain and was shouting.

1. Estimate the percentage of surface area involved in the injury.
2. What precautions do you take in burns on the face?
3. In burn injury involving surface area greater than 10%, what problems do you anticipate?
4. Is fluid treatment necessary? How do you calculate the amount?
5. Discuss the ways to relief pain.
6. Describe the prophylactic measures against complications.
7. Elaborate the preventive measures for injuries like the one mentioned above.

7. Acute Poisoning

A poison is any substance either taken internally or applied externally that is injurious to health or dangerous to life. The most common causes of acute poisoning are chemicals that enter the body through various routes. These include:

1. Household poisons (drugs, insecticides, rodenticides or pesticides, lye, polishes, kerosene, gasoline, bleaches, sprays or fumes, etc).
2. Agricultural poisons (insecticides, herbicides and fungicides, rodenticides or pesticides, charcoal, fertilizers, etc).
3. Industrial chemicals (dust, spilled liquids, local exhausts, etc.).

The major routes of entry of poisons in to the body are:

1. The alimentary tract (e.g. swallowing)
2. The respiratory tract (e.g. inhalation)
3. Skin and mucous membranes (e.g. by absorption from the surface of the skin, contamination of the eye)
4. Circulatory systems and other soft tissues (e.g. I.V. and I.M. Injections)

Patients with poisoning may initially appear asymptomatic or with a varying degree of overt intoxication. Therefore it is always important to take the following three intervention measures aimed at:

- Reduction of absorption
- Increasing excretion
- Supportive measures

General measures to be taken at a health center level

1. Follow the ABC's - of emergency care see core module
2. In cases of poisoning related to the skin and eyes, wash the affected area with copious amount of luke warm water or saline.
3. Remove the poison from the alimentary tract as soon as possible by physical induction if indicated

4. Give activated charcoal
Adult: 50-60 gm PO or NGT
Children: 1gm/kg body weight activated charcoal PO or NGT or more ideally 10 gm charcoal/gm ingested toxin.
5. Maintain fluid and electrolyte balance
6. Control of pain, e.g. in corrosive poisoning
7. Broad-spectrum antibiotics to prevent pulmonary and other infections – may not be necessary.
8. Observation of the patient for about 4 -6 hrs - for seizures, unresponsive hypotension.
9. General nursing care including bladder and bowel care in comatose patients
10. Refer the patient to a hospital but avoid supine position during transportation

Pesticides (Organophosphates like malathion) –

Lead to parasympathetic over stimulation by inhibiting cholinesterase.

Clinical features - miosis (pin-pointed pupils)

- Excessive salivation
- Abdominal cramp
- Sweating and lacrimation
- Bronchospasm and excessive bronchial secretion
- Nausea
- Vomiting
- Diarrhea
- Muscle twitching and excessive skeletal muscle weakness (flaccid paralysis)
- Convulsion
- Tachycardia initially (Nicotinic effect)
- Bradycardia later (Muscarinic effect)

Generally organophosphate poisoning must be suspected with-patients that have miosis, sweating and hyperperistalsis.

Treatment

- Complete rest
- Remove contaminated clothing
- Wash contaminated skin
- Do gastric lavage
- Administer activated charcoal
- Atropine 2 mg i.m. or i.v. slowly to counter act the parasympathetic stimulation

Refer the patient to a hospital for further management

Chlorinated insecticides or organochlorine compounds (e.g. DDT)

Are CNS stimulants that cause poisoning if ingested, inhaled or through direct contact to the skin. DDT has an estimated lethal dose of about 20gm.

Clinical features - Vomiting, apprehension, nervous irritability, muscle twitching, tremor, arrhythmia, delirium, convulsion and coma.

Treatment - Resuscitation of the patient (see core module)

- Don't induce vomiting
- Gastric lavage
- Give activated charcoal
- Decontaminate exposed areas of the body by repeated soap washing
- Diazepam 5 - 10 mg against convulsion

Poisonous animal and insect bites (snakes, scorpion, spider, etc.)

Poisonous animal and insect bites are common in Ethiopia. Therefore it is imperative to know about the poisonous animals and insects in a given locality

and the measures to be taken in the prevention of accidents caused by poisonous animals and their methods of management.

Manifestations of poisoning caused by animal bites

Poisonous animal bites usually have local and systemic manifestations.

Local manifestations:

- Intense local pain · Swelling
- Redness · Tissue necrosis

Systemic manifestations:

- Anaphylaxis and shock · Dizziness
- Cold sweats · Hyperventilation
- Nausea · Pulmonary edema
- Vomiting · Abdominal pain
- Agitation · Renal failure
- Arrhythmia · Convulsion
- Tachycardia · Coma

Emergency measures

1. Do the resuscitative measure as in the core module.
2. Immobilize the patient and the bitten part in a horizontal position by splinting. Do not allow the patient to take alcoholic drinks or stimulants.
3. Cleanse the wound with water or disinfectant
4. Cool the wound locally with cold water (do not use ice as it may harm the tissue).
5. Give analgesics if pain is severe (avoid opiates as they may cause respiratory depression and alter mental status).
6. Sedate the patient (diazepam). If needed
7. Transport the patient lying (on stretcher) without delay to a hospital for definitive therapy.

8. If symptoms develop fast, apply constricting bands just proximal and distal to the bite, if the accident is within less than 30 minutes. Loosen the bandage intermittently as swelling progresses. They should remain there until definitive therapy is instituted



3.2 Satellite Module for Public Health Nurses Injury Prevention and Management

3. 2. 1. Introduction

The objective of preparing this satellite module is to provide the nurses with the knowledge and skills needed to assess injured persons. The module also incorporates information on causes of injuries and the appropriate nursing measures.

3. 2. 2. Learning objectives

The main purpose of this satellite module is to enable the nurses to:

1. Assess the conditions of the injured persons
2. Identify the patient's problems related to injuries (nursing diagnosis)
3. Establish goals for nursing intervention
4. Put the established goals into action
5. Evaluate the interventions (activities put into action)

3. 2. 3. Learning activity

Case study

Ato Kumma, a 52-year-old man, was brought to the health center after he sustained injury to both upper extremities and one lower extremity involving deeper structures. The health officer has diagnosed that Ato Kumma has signs of fractures on the involved parts in addition to soft tissue injuries.

Based on the above information:

1. Identify the actual problems.
2. Describe the nursing intervention measures.
3. What are the expected complications?
4. What will be your role in the prevention of these complications?
5. How do you evaluate the response to the interventions?

3. 2. 4. Nursing assessment

Assessment begins with the nurse's first encounter with the patient. It involves the systematic collection of data about the patient's actual and potential problems and the use of these data to formulate nursing diagnosis.

- Take complete nursing history
- Carry out physical examination in order to determine the patient's mental status, physical limitations etc.
-

3. 2. 5. Nursing diagnose

Are those actual or potential problems, which could be resolved by means of nursing action

- Identify the patient's problem and its particular characteristics
- State the nursing diagnosis precisely.

In cases of accidental injuries, there could be:

- Inadequate airway clearance
- Loss of function in particular structures (limited activity)
- Fluid volume deficit (in cases of burn)
-

3. 2. 6. Nursing plan

- Establish goals for nursing intervention.
- Based on the seriousness and extent of injury, set priorities
- Identify nursing interventions appropriate for goal achievement
- Formulate the care plan

3. 2. 7. Nursing intervention (implementation)

- Put the nursing care plan into action
- Coordinate the activities
- Ask for assistance
- Record the patient's response to nursing intervention

3. 2. 8. Evaluation

- Determine the extent to which the goals are achieved
- Identify change due to the intervention.
- Assist in the referrals to appropriate institution.

3. 2. 9. The role of the nurse in handling accidentally injured persons

- Understand and practice working with the health center team
- Assess the patient's status (physical and emotional)
- Set priorities
- Do the necessary nursing care in order to promote, maintain, and restore health.
- Check vital signs
- Promote comfort and relief of pain.
- Arrest bleeding and immobilize the injured part
- Monitor respiration, fluid intake, output, fluid deficit and signs of shock.
- Prevent wound infections.
- Provide frequent reassurance to patient and family.
- Do all measures which help to empty the urinary bladder
- Ensure asepsis during dressing changes.
- Stay with the patient as needed.

3.3. Satellite Module for Environmental Health Students on Injury Prevention and Management

3. 3. 1. Introduction

Studies show that majority of injuries occur with greater frequency and much greater severity in workplaces and residential environment. This is basically due to unsafe work and home environments, as well as lack of awareness and negligence.

Therefore, this satellite module is designed to equip environmental health students with the appropriate knowledge, attitudes and skills required to prevent injuries together with the other team members. It also consists of some promotive, preventive and rehabilitative services that should be delivered at individual, family and community level.

3. 3. 2. Learning objectives

At the end of this satellite module, environmental health students should be able to:

1. Identify predisposing factors for accidents and injuries
2. Describe the common causes of accidents and injuries
3. Devise accident and injury prevention measures

3. 3. 3. Learning activity

Case study

Ato Azanaw Belete, a 30 year old man living in Metema town, North Gondar administrative region, came to the health center on Monday at 9:30 am with injury to the right hand while he was working in a cotton processing factory. The environmental health worker in charge of the health center found that Ato Azanaw has profuse bleeding with deep wound on the thumb and index finger.

Just after the report of the injury, the environmental health students went to the factory for inspection. They found that the factory was very old, some machines with unguarded rotating belt and protruded parts, and overcrowded working conditions. Further, they observed poor lighting, ventilation, excessive heat, and noise in the factory. They also identified that majority of the workers were uneducated and inexperienced with long working hours.

Based on the above case study answer the following questions.

1. If you were in charge of the above health centre what do you do first?
2. What are the possible predisposing factors for the above injuries?
3. What are the possible causes for the above injury?
4. How do you prevent the occurrence of such injuries?

3. 3. 4. Predisposing factors for injuries

See core module

3. 3. 5. Common causes for injuries.

See core module

3. 3. 6. Injury prevention

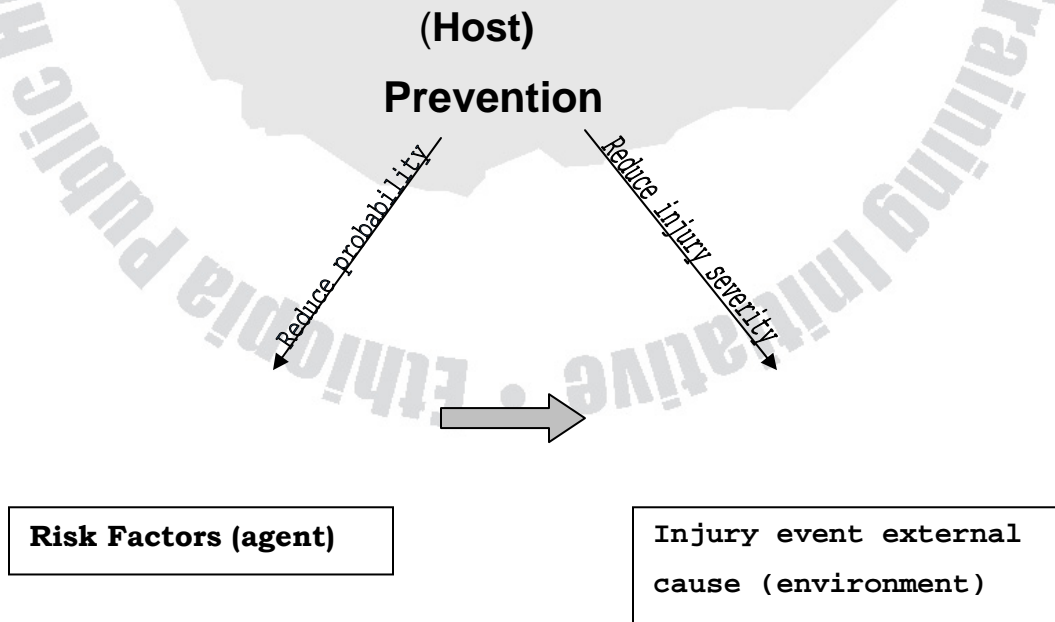
The role of environmental health technician in injury prevention is mostly on awareness creation, improvement on working and home environment and behavioural changes in injury prevention practice so as to reduce morbidity, mortality and disability.

Therefore, environmental health workers should do the following activities to prevent injuries:

1. Provide information and education on injury prevention methods
2. Give first aid for those who are injured

3. Establish sound sanitary condition within the rehabilitation centers such as water supply, waste disposal, canteen, cloakroom, shower and hand washing facilities.
4. Involve in the rehabilitation of the injured.
5. Determine whether the work environment and working conditions are harmful to health and prevent such conditions from occurring.
6. Conduct survey for evidence of accidents and injuries in the community.
7. Give professional advice to guard securely moving parts of machinery, keep away combustible material, avoid shock, friction, sparks and heat.
8. Protect fire using stoves and heaters mounted with fireproof materials. Cylinders are better placed outside the kitchen and smoke pipes (chimney) should be placed away from combustible walls.
9. Supervise occupational environment and give training for workers on how to prevent and control accidents in work places and home environment.
10. Educate the public not to practice certain traditional behaviours that may result in injuries.

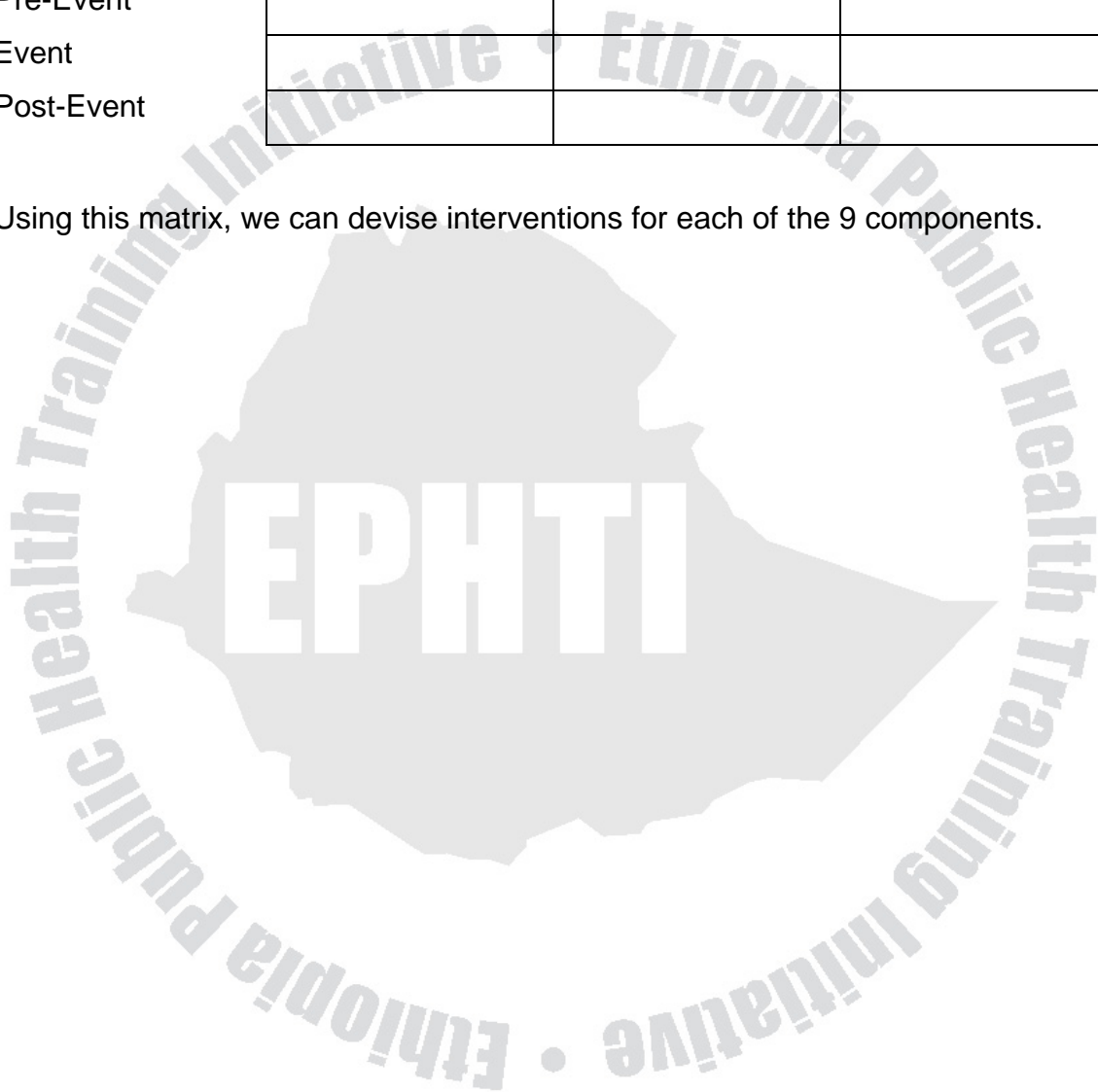
Chain of injury events and opportunities for injury control (injury triangle)



Injury occurs because of a process involving these 3 factors. Haden developed a way to analyze injury prevention/control:

	Host	Agent	Environment
Pre-Event			
Event			
Post-Event			

Using this matrix, we can devise interventions for each of the 9 components.



3.4. Satellite Module for Medical Laboratory Students on Injury Prevention and Management

3. 4. 1. Introduction

This satellite module provides the specific tasks and skills that should be done by a medical laboratory technician in health center in the prevention and management of trauma.

3. 4. 2. Learning objectives

Upon completion of the activities in this module, the students will be able to:

1. Organize the emergency laboratory tests (services) needed for patients with injuries.
2. Perform the required laboratory tests needed to manage trauma.

3. 4. 3. Learning activity

Case study

Ato Belete Alemu is a 35-year-old man living in Debebahir, a small village near Debark town, North Gondar administrative zone. He was bitten by a dog over the face and the leg and came after a day to Debark health center. On examination the wounds were bleeding and patient's palms and conjunctivae are pale. Based on the above information, answer the following questions.

1. Suppose you are the only medical personnel available in the health center, mention the possible emergency care that you can do for this particular patient.
2. Outline the most important laboratory tests that need to be done for the patient.
3. What do you understand from the paleness of the palms and conjunctivae?
4. List the laboratory procedures that you can do to investigate the wounds.

3. 4. 4. Laboratory diagnosis

Emergency laboratory diagnostic tests for specific trauma are summarized in table – 1. below

Table –1: - Common trauma and the recommended laboratory tests.

Types of injuries	Recommended laboratory tests
Hemorrhagic shock	Hemoglobin/hematocrit, blood group and cross - match
Wound	Gram's stain and culture
Head injuries	Hemoglobin/hematocrit, blood group and cross-match
Abdominal injuries	Hemoglobin/hematocrit, blood group, cross-match, leukocytes and urinalysis

UNIT FOUR

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Melkie Edris B.Sc in Public Health Gondar Public Health College, Addis Ababa University, M.Sc in Applied Human Nutrition University of Nairobi, Kenya, Associate Professor of Nutrition in Gondar University.

Getu Degu B.Sc. in statistics AAU. M.Sc. in Medical statistics London school of hygiene and tropical medicine, London. Associate professor and head of department of community health, Gondar University.

Cherent Bahiru M.D. A. A.U. Gondar College of Medical Sciences. PHD. University of Leipzig FRG Associate Professor of Human Anatomy in Gondar University.

Abebaw Eredie – RN AAU – Gondar College of Medical Sciences. MSc Humboldt University Berlin – Germany – Lecturer in School of Nursing, Gondar University.

Gashaw Messele M.D. Gondar College of Medical Sciences Specialty certificates in General Surgery AAU MF Assistant Professor of Surgery Gondar University

Baye Gelaw MLT. Gondar College of Medical Sciences and National Research institute of health, B.Sc Jimma University, M.Sc AAU lecturer of Medical Microbiology in Gondar University.

Takele Taddese

Zeki Abdurahman M.D A.A.U. Gondar College of Medical Sciences. Speciality Certificate A.A.U. Medical Faculty, Assistant Professor of surgery in University of Gondar

Mamo Wubshet, Diploma. Gondar College of Medical Sciences. BSc in Environment health Jimma University. M.Sc. IHE, Delm the Netherlands, lecturer in Environmental Health, University of Gondar



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Annex

■ The Glasgow coma scale

		Scale
Eyes Open:	spontaneously	4
	to speech	3
	to pain	2
	never	1
Best verbal response:	oriented	5
	confused	4
	inappropriate words	3
	incomprehensible sound	2
	none	1
best motor response:	obeys commands	6
	localize pain	5
	flexion to pain:	
	withdrawal	4
	abnormal	3
	extension to pain	2
	none	1
	<u>Total</u>	<u>3-15</u>

This score has been modified to be applicable to children, including those who have not learned to speak.

Eye movements:	directed (e.g. follows mother's face)	1
	not directed	0
Verbal response:	appropriate cry	2
	moan or inappropriate cry	1
	none	0
best motor response:	localizes painful stimulus ^a	2
	withdraws limb from pain ^b	1
	non-specific or absent response	0
	total	0-5

these scales can be used repeatedly to assess improvement or deterioration.

^a Rub knuckles on patient's sternum.

^b Firm pressure on thumbnail bed with horizontal pencil.