

6. Do not let the injured person continue the activity – rest is required.
7. Arrange transport to a healthcare facility.

Important facts to remember :

- The skeleton is a body supporting system consisting of 206 separate bones in an adult.
- The bones in the skeleton system are joined together by means of cartilage, ligaments and muscles.
- The skull is made up of 22 bones (21 immobile, 1 mobile) joined together.
- The vertebral column consists of 33 small pieces of bones starting from skull to the tail bone below.
- The thigh bone, called the femur, is the longest and strongest bone in the body.
- Joints are the places at the junction of two or more bones. They may be immovable joints like in skull or movable joints as in the knee, elbow, shoulder and hip joints.
- Muscles to the layman mean “flesh” and produce movement of the limbs and organs. These are of two types- voluntary muscles and involuntary muscles.
- A fracture is a break/bend or crack in a bone.
- If the nose is bleeding, ask the victim to gently press the nostrils with the head tilted forward to stop the bleeding.
- A splint is a rigid piece of wood, plastic or metal that is applied to the fractured limb to support it and to prevent further movement of the broken bone(s).
- A sprain is when the ligaments of a joint or the tissues surrounding the joint are torn.

8. Arrange appropriate transport to the nearest healthcare facility.
9. Do not give the casualty anything to eat or drink.
10. Follow standard procedure to stop bleeding, provide recovery positioning needed and start CPR when no breath.

Important points to remember when fracture of different parts:

1. Head, neck and spinal injuries can be very serious and should always be managed with caution.
2. Patient may feel nausea or vomiting, sleepy, loss consciousness and in case of head injuries.
3. If fracture is in the head, keep the head still, place your hands or tightly folded clothing on each side of the injured person's head. Keep the head and neck of the person still only if the person allows you to do so.
4. If the spinal cord injury is suspected, the injured person should continue to lie still until transported to a hospital. At least 3 people should assist in moving the person like a log of wood to transport him to the nearest healthcare facility or hospital. Do not give the casualty anything to drink or eat.
5. In case of fracture of the cheekbone or nose, there might be swelling, deformity of the nose or face, bleeding from nose and mouth.
6. Apply a cold compress gently on the affected area. This helps to reduce the swelling and pain in case of a cheekbone injury.
7. If the nose is bleeding, ask the victim to gently press the nostrils with the head tilted forward to stop the bleeding.
8. If one or more teeth have fallen out, you can put them in a clean closed container in fresh egg white, fresh coconut water or fresh whole milk. If none of these are available, ask the casualty to put saliva in the container. Mark the container with the name of the casualty and the time of collection. Make sure the container is transported to the hospital together with the casualty.

FRACURE IN ARM

In case of a broken arm bone, tell the person to immobilise the affected arm by holding his arm close to his body. If the person can't support the arm, provide a sling with a triangular bandage and provide suitable padding between arm and chest. Always tie the knots (reef knot) on the opposite side of the thorax and not on the fractured forearm.

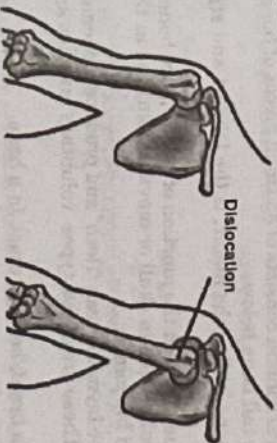
In case of a suspected forearm fracture, you might apply a splint (only when the necessary expertise is available): A splint is a rigid piece of wood, plastic or metal that is applied to the fractured limb to support it and to prevent further movement of the broken bone(s). Reasonably wide splints are better than narrow ones. In emergency cases, splints can be improvised: a folded newspaper, a piece of wood or a book can be used. The splint should be long enough to immobilise the elbow and the wrist of the fractured forearm. The splint should be padded with cotton or cloths to make it fit softly and snugly on the injured forearm. The splint is best applied over the clothing. If the broken arm looks deformed or dislocated, do not try to reset it. This might make the injury worse and will cause pain.

DISLOCATIONS (INJURIES TO JOINTS)

A dislocation is a displacement of a bone at a joint, like the knee or shoulder. The supporting tendons at the joint (the ligaments) might be damaged.

Dislocations are mostly the result of an external force that impacts the body. For example: a dislocation of a shoulder can happen by a heavy fall on the hand. If a person has dislocated bone, you might observe the following signs and symptoms:

1. The joint looks deformed.
2. The person has pain.
3. The casualty cannot move the joint.
4. There might be swelling and bruising in the area of the injury in due course of time.



What to do-

1. Do not try to reset the dislocated bone back into place.
2. Provide first aid as in fracture of similar area.

STRAINS AND SPRAINS (INJURIES TO LIGAMENTS, MUSCLES AND TENDONS)

A muscle can be strained by overstretching it. Muscles can also be ruptured (a tear): the muscle itself or the tendon is then torn. A sprain is when the ligaments of a joint or the tissues surrounding the joint are torn. Strains might happen as the result of a twist or sudden effort, like lifting a heavy object. Sprains might be caused by a sudden wrenching or twisting of the joint. Ankle sprains are quite a common example of this. In case of a strain, you might observe following signs and symptoms:

1. Pain in the affected muscle,
2. Swelling,
3. Bruising, or
4. Loss of movement.
5. The casualty is unable to use or put weight on the joint.

What to do-

1. The application of a crepe bandage or a compression bandage is not recommended and not necessary in case of injuries to muscles or joints.
2. Wrap ice in a cloth or a towel and apply it to the injury. Ice can reduce pain and improve healing. The ice should not touch the skin directly!
3. If you do not have ice, use cold water and make a cold compress. Do not apply for more than 20 minutes.
4. Do not massage the injury.
5. Do not put heat on the injury.

JOINTS

Joints are the places at the junction of two or more bones. They may be immovable joints like in skull or movable joints as in the knee, elbow, shoulder and hip joints.

In movable joints, the ends of the bones are covered by cartilage, the joint is encased in a capsule containing a lubricant material.

a. **Ball and socket joints** : as found in the shoulder and hip. The rounded head of the bone enters the socket of the other bone, allowing movement in several directions and planes.

b. **Hinge joints** : as the ankle, elbow or the knee. These joints allow movement in one plane only as with the hinge of a door.

c. **Gliding joints** : as in the wrist, feet, between the ribs and the vertebrae of the spinal column. These joints allow only limited movements.

MUSCLES

Muscles to the layman mean "flesh" and produce movement of the limbs and organs. An individual muscle consists of bundles of long muscle fibres. The whole muscle is covered with a strong connective tissue sheath and attached to a bone by inextensible tendons. There are two types of muscles:

a. **Voluntary muscles** : which are under the control of the will and are generally attached to the skeleton.

b. **Involuntary muscles** : like those found in the heart and digestive system, work without the control of the will but are under the influence of the autonomous nervous system.

FRACTURES (INJURIES TO BONES)

A fracture is a break/bend or crack in a bone. Generally, a considerable force is needed to break a bone unless it is diseased or old.

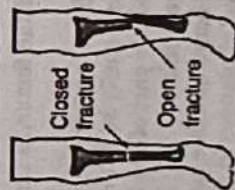
Causes of Fractures

Fractures may happen when direct (a blow) or indirect force (a twist, wrench) is inflicted on a bone. By direct force, the bone breaks at the spot of application of the force, e.g. a severe fall on a projecting stone or a wheel passing over the body, etc. By indirect force, the bone breaks at the spot away from the spot of application of force, e.g. collar bone fracture when the fall is on outstretched hands, etc. The fracture may also occur due to a violent contraction of a group of muscles (e.g. a fracture of ribs on violent cough).

Types of Fractures

a. **Closed Fractures** : The skin above the fracture is intact, although the bone ends may have damaged nearby tissues and blood vessels.

b. **Open Fractures (Compound Fractures)** : The skin above the fracture is not intact. There is bleeding. The bone is exposed to the outside air at the surface; dirt, dust and germs can enter the wound. There is a high risk of infection.



Simple and Complex Fractures

Fractures are considered to be complex when :

- The bones are broken into many pieces.
- The soft tissues and vital organs are severely damaged.
- There are multiple fractures at several levels in a single bone.
- There is an associated joint dislocation or joint injury.
- Otherwise, the fracture can be classified as a 'simple fracture'.

Symptoms of fracture

1. Pain at the spot of fracture or around it.
2. Tenderness i.e. pain on touching over the injured spot.
3. There might be swelling of the area around the fracture.
4. There might be bleeding at the location of the fracture.
5. The bone might be sticking out.
6. There might be a discolouration in the area of the fracture.
7. The injured may have lost the capability of normal movements of the affected part.
8. There might be a deformity of the affected limb. The limb may have lost its normal shape and movement.
9. The response of an injured person to a dislocated limb or a broken bone can be very different. Some people might even be able to walk with a broken leg with some pain, whilst others might not be able to move at all.
10. If you are not sure whether a bone is broken, it is safer to assume that it has broken.
11. If the broken leg looks deformed or dislocated, do not try to reset it. This might make the injury worse and will cause pain.

What to do-

1. Safety first and call for help
2. Try not to come in contact with the person's blood, use gloves.
3. If fracture has occurred in an accident, decide which injury is more urgent. Provide CPR first when the casualty is not breathing. Try to stop bleeding first, if present.
4. Try not to move the broken or dislocated limb unnecessarily.
5. Try not to move the casualty until the injured part has been secured.
6. If the casualty is able to support the injured part, ask him to do so,
7. You can immobilize the injured part with a bandage or a splint (if the first aider is experienced in these techniques).



CHAPTER 9

FIRST AID RELATED TO BONES, JOINTS, AND MUSCLE-RELATED INJURIES

THE SKELETON SYSTEM

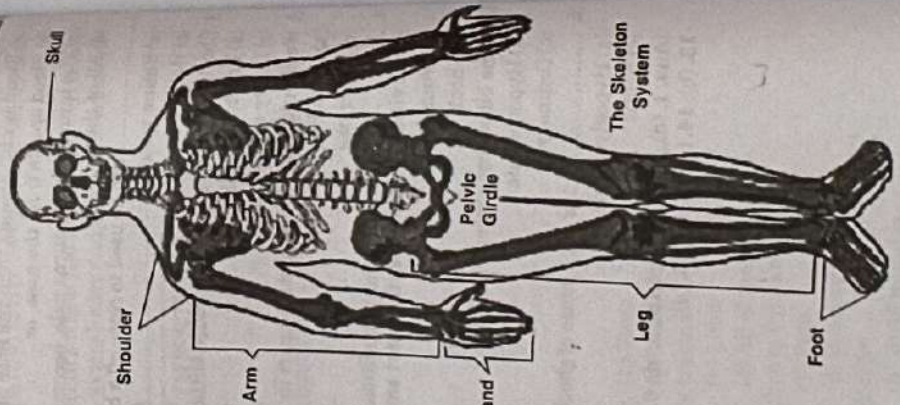
The skeleton is a body supporting system consisting of 206 separate bones in an adult. The bones in the skeleton system are joined together by means of cartilage, ligaments and muscles. The bones in different parts of the body are briefly described as follows :

The Skull-

1. The skull is made up of 22 bones (21 immobile, 1 mobile) joined together.
2. The bones of the skull provide protection for the brain and the organs of vision, taste, hearing, equilibrium, and smell. The bones also provide attachment for muscles that move the head and control facial expressions and chewing.

The Backbone or Spine-

1. The vertebral column consists of 33 small pieces of bones starting from skull to the tail bone below. Each small bone is called a vertebra (plural-vertebrae) placed one above the other.
2. The vertebral column can be divided in different regions:
 - 7 cervical vertebrae in the neck referred to as C1-C7;
 - 12 thoracic or dorsal vertebrae from the back referred to as T1-T12;
 - 5 lumbar vertebrae at the waist region form the lower back referred to as L1-L5;



- 5 sacral vertebrae at the hip region, fused together, form the sacrum; and
- The remaining 4 form the tail bones.
- 3. Between each pair of vertebrae is a disk of cartilage that acts as a shock absorber and allows movement.
- 4. Muscles and ligaments attached to the vertebrae stabilize the spine and control the movement of the back.
- 5. Inside the central canal, the spinal cord passes, which carries impulses from and to the brain.

The Ribs and Breast Bone (sternum)-

1. The lungs and heart are protected by the thoracic cage. It consists of 12 pairs of ribs attached to the corresponding vertebrae at the back.
2. The first seven pairs of ribs are attached to the breastbone (also called sternum) in the front.
3. The eighth, ninth and tenth pairs of ribs are each attached to the rib above.
4. The eleventh and twelfth pair of ribs have no frontal attachment and are called floating ribs.

The Shoulder

Each shoulder consists of -

1. A collar bone (Clavicle) in the front on each side of the upper part of the breast bone, and
2. A shoulder blade (Scapula) on each side at the upper outer back.

The Upper Limb : Arm, Elbow, Wrist and Hand

The bones of the upper limbs (arms) are :

1. The upper arm called humerus;
 2. The forearm bones radius (outer side) and ulna (inner side bone)
- The joint between the upper arm and forearm is called the elbow.
1. There are eight carpal bones in each wrist, five metacarpal bones in each palm and three small bones called phalanges in each finger (only two in each thumb).

The Pelvis

1. Two hip bones, one on either side, join together to form the pelvis. The hip bones are attached at the back with the lower part of the vertebral column. At the front, it is attached together with ligament called symphysis pubis.
2. The pelvis forms a basin shaped cavity which contains intestines, urinary bladder and reproductive organs. There are two sockets, one on either side of the pelvis, where the thigh bones join, forming the hip joint.

The Lower Limb : Leg, Knee, Ankle and Foot-

1. The thigh bone, called the femur, is the longest and strongest bone in the body.
2. The knee joint in the front is covered with a small bone called the knee cap or patella, which can easily be felt under the skin.
3. The two bones of the lower part of the leg are called the tibia, and the outer bone is called the fibula.
4. There are seven tarsal bones and five metatarsal bones in each foot, and three small bones called phalanges in each finger (two in each big toe).

11. Observe the casualty's consciousness and breathing.
12. If the casualty loses consciousness, put him in the recovery position.
13. If the casualty stops breathing, start CPR.
14. Arrange urgent transport to the nearest healthcare facility or hospital.

Important facts to remember :

- A wound is an injury in which the skin or another surrounding surface is torn, pierced, cut or otherwise broken.
- Different types of wounds are – abrasions, incisions, Contusions/ bruises, Lacerations, Puncture wounds and amputations.
- Abrasions are superficial wounds in which the topmost layers of the skin are scraped off, these are painful, but bleeding is less.
- Amputation is the removal of a limb by trauma.
- Germs are tiny organisms, invisible to the human eye, that can cause diseases. Germs are bacteria, viruses, fungi and protozoa.
- Pus formation is part of the body's method to fight an infection.
- Re-attachment of amputated limbs, fingers or toes might be possible if the injured and the amputated part(s) arrive at the hospital as soon as possible.
- This life-threatening condition occurs when the circulatory system fails and as a result, vital organs such as the heart and the brain are deprived of oxygen.

8. Always urgently transport the casualty with an abdominal injury to the nearest healthcare facility.

AMPUTATION

Re-attachment of amputated limbs, fingers or toes might be possible if the injured and the amputated part(s) arrive at the hospital as soon as possible.

In case of an amputation :

1. Control the bleeding by providing direct pressure to the wound. Put clean cotton bandage on the wound.
2. Place the amputated part in a clean plastic bag.
3. If possible, place the packed amputated part in a container of ice. Do not put ice directly on the amputated part – the amputated part should always be packed in a clean plastic bag.
4. Do not put liquids or antiseptic products on the amputated part.
5. Mark the package clearly with the casualty's name and the time when the amputation occurred.
6. Arrange urgent transport of the casualty and the amputated part to the nearest hospital. If the amputated part has been recovered, do not forget to send it together with the casualty.

CRUSH INJURIES

Traffic accidents, building site accidents, explosions and natural disasters (e.g. landslides, earthquakes) are the most common causes of crush injuries. Crush injuries may include fractures, bleedings and swelling.

In case of a crush injury :

1. Try to keep the head of the victim as low as possible.
2. Monitor the respiration and consciousness of the victim.
3. If the victim stops breathing, start CPR.
4. Arrange urgent transport to the nearest healthcare facility or hospital.

SHOCK

This life-threatening condition occurs when the circulatory system fails and as a result, vital organs such as the heart and the brain are deprived of oxygen. It requires emergency treatment to prevent permanent organ damage and death. Shock can be made worse by fear and pain. Whenever there is a risk of shock developing, reassuring the casualty, making him comfortable and keeping him warm may be sufficient to prevent him from deteriorating.

Causes of Shock

Hypovolemic shock : The most common cause of shock is severe blood loss. If the blood loss exceeds 1.2 litres (this is about one-fifth of the normal blood volume of an adult), shock may occur. The blood loss may occur due to external and/or internal bleedings. Loss of other body fluids can also result in shock. Conditions that cause heavy fluid losses include diarrhoea, severe burns, etc.

Cardiogenic Shock : In addition, shock may occur when an adequate volume of blood is available, but the heart is unable to pump the blood around. This problem can be due to severe heart diseases, heart attack or acute heart failure.

Other types of shock : Other causes of shock include overwhelming infections (septic shock), lack of certain hormones, low blood sugar level (hypoglycaemia) (metabolic shock), under-cooling (hypothermia), injuries to the

respiratory tract or lungs (respiratory shock) and severe allergic reactions (anaphylactic shock), drug overdose or spinal cord injuries (neurogenic shock).

Symptoms :

- Rapid pulse;
- Pale looks;
- Cold, clammy, sweaty skin.

As shock develops :

- Rapid, shallow breathing;
- Cold, clammy skin;
- Rapid, weak pulse;
- Dizziness or fainting;
- Weakness;
- Eyes appear to stare;
- Anxiety or agitation;
- Seizures;
- Confusion or unresponsiveness;
- Low or no urine output;
- Bluish lips and fingernails;
- Sweating;
- Nausea and vomiting might occur.
- The casualty might feel thirsty.
- The casualty might become restless and aggressive.
- The casualty might complain of chest pain.

What to do

1. Reassure the casualty (when conscious)
2. Treat the possible cause of shock that you can detect, such as a severe bleeding.
3. Lay the casualty comfortably on his back on a blanket. However, in cases of injury of the head, chest or the abdomen, lower the head slightly and turn it to aside.
4. In cases of vomiting, put the casualty in the recovery position.
5. You may raise and support the legs. However, do not do this when you suspect a fracture or spinal injuries.
6. Loosen the tight clothing.
7. Keep the injured person warm by taking off wet clothing, covering him with a blanket or other covering, taking care not to overheat him.
8. Never use hot water bottles or very warm rugs. Do not rub any part of the body to get him warm.
9. In case of major injuries, nothing should be given by mouth as he may later need an operation or blood transfusion.
10. The general principle is never to give food or drink to a casualty. Important exceptions include hypothermia (low body temperature), hypoglycaemic shock (low blood sugar in a diabetes patient), diarrhoea and fever leading to dehydration and in case of heat exhaustion or heatstroke when the person remains conscious.

9. Use adhesive strips to close a clean cut. If no strips are available, use a bandage. Bandage the dressing to the wound.
10. Do not apply the bandage too firmly.
11. If the part of the body below the bandage changes colour, is swollen or is feeling numb, loosen the bandage a little bit.
12. Tell the injured person or the person caring for him to keep the wound dry after cleaning with water or getting wet. Every 2 or 3 days the wound should be cleaned and the dressing should be changed.
13. If a dressing needs to be changed, do not tear the old one off as this may damage the healing wound. Instead, put enough water (preferably clean water if available) on the old dressing so that it comes off easily.
14. If the wound is infected, then always refer to a healthcare facility for further care.

Even small wounds need attention to prevent infection. Even if the injured person has received appropriate medical care, there is a need to watch for signs of infection in the wound. The following signs might indicate an infection:

- Pain that is getting worse;
- Swelling, hot or red skin around the wound;
- The wound shows discharge, or
- Person having fever or feeling unwell.

In these cases, the injured should seek further medical help.

HEAD INJURIES

The scalp has many small blood vessels near the skin surface. Any cut or abrasion can result in profuse bleeding and may make the wound appear worse than it is. In case of a severe head injury, a watery fluid (cerebrospinal fluid) and blood may flow out of the nose, ear(s) or mouth.

In case of suspecting a severe head injury:

1. Ask the injured not to blow his nose.
2. Do not pack the ear or nose. You may eventually place a light dressing on the ear or nose.
3. If the person is breathing, put him in recovery position. Be aware of the risk of neck (spinal) injury.
4. Urgent transport to the nearest hospital is required.

NOSE BLEED

The nose contains small blood vessels that can bleed easily. A nosebleed can be the result of a blow to the nose or trauma to the face but can also occur spontaneously because of dryness inside the nose. Other causes include a foreign object in the nose, infection, common cold, allergies, high blood pressure, altitude, a dry environment, alcohol abuse, disease and the use of certain medications. During a nosebleed, blood may flow from one or both nostrils. The flow may last from a few seconds to several minutes.

In case of a nose bleed:

1. Ask the person to pinch his nose above the nostrils with index finger and thumb. Tell the injured person to breathe through the mouth.
2. Ask the injured person to lean forward so that he does not swallow blood. Swallowing blood can make the person feel sick.
3. Pinch the nostrils for 10 to 15 minutes. If necessary, pinch the injured person's nose yourself.

In a few cases, a nose bleed can be serious and lead to death. The person should seek medical help if:

1. Blood is still coming from the nose after 20 minutes;
2. The nosebleed was caused by a hard punch on the nose; a fall, a road accident, etc.;
3. Blood spurts from the nose, or
4. The injured person turns pale, becomes sleepy or falls unconscious.

BLEEDING OF THE GUMS

Bleeding may occur immediately or after some time after tooth extraction.

In case of bleeding of the gums:

1. The person may rinse his mouth with water or saline water.
2. A thick cotton ball can be put in the casualty's teeth socket and tell him to bite on the cotton ball to stop the bleeding.
3. Refer the person to a healthcare facility.

CHEST INJURIES

Injuries to the chest are always serious. Without being visible, there might be fractures of the ribs, tear of the lung, injury to the heart and injuries to blood vessels. In case of a penetrating injury, a condition called 'pneumothorax' may occur. Air can enter between the lung membranes and exert pressure on the lung and make the lung collapse. The pressure may build up affecting the other lung making the injured breathless. Air may also come out from the wound during breathing.

In case of a chest injury:

1. Place him in a half-sitting position and control the bleeding by providing direct pressure to the wound. Leave the open chest wound exposed. Do not apply an occlusive dressing. Eventually, put a light dressing on the wound that is not occlusive.
2. You may also encourage the injured to lean towards the injured side and use his hand to cover the penetration wound.
3. If the casualty becomes unconscious but keeps breathing, put him in the recovery position.
4. If the casualty stops breathing, start CPR. Arrange urgent transport to the nearest hospital.

ABDOMINAL INJURIES

Stab wounds, gunshots or crush injuries to the abdomen cause serious and potentially life-threatening wounds.

In case of an abdominal injury:

1. Control the bleeding by providing direct pressure to the wound.
2. Put a clean cotton bandage on the wound.
3. Adjust the position of the victim, so the wound does not gap.
4. If the intestines come out, cover the intestines with a clean plastic bag or a clean pad. Do not touch the intestines that came out.
5. Do not give anything to drink or eat.
6. If the casualty becomes unconscious but is breathing, put him in the recovery position.
7. If the casualty stops breathing, start CPR.

CHAPTER 8

WOUNDS AND INJURIES

WOUNDS

A wound is an injury in which the skin or other surrounding surface is torn, pierced, cut or otherwise broken. Wounds can be external or internal to the body. Each type of wound carries specific risks associated with the surrounding tissue damage and infection.

Types of Wounds

a. Abrasions: These wounds are superficial wounds in which the top layers of the skin are scraped off, leaving a raw, tender area. These wounds appear often when experiencing a sliding fall (e.g. of a bike). The wounds often contain embedded foreign particles which may result in infections. Abrasions do not bleed much but are usually very painful.

b. Incisions: Incised wounds are caused by sharp instruments such as a knife, razor, etc. The blood vessels show a straight cut and bleeding may be profuse. Other structures such as tendons and nerves may be damaged too.

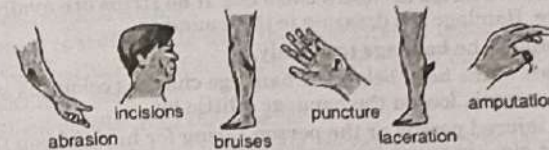
c. Contusions (bruises): Contused wounds are caused by blows, by blunt instruments or by punching. The capillaries are ruptured by the punch and blood leaks into the tissues. Severe contusion might be an indication of deeper damage, like a fracture or internal injury.

d. Lacerations: Lacerated wounds are caused by crushing, ripping forces by machinery, or clawing of animals resulting in tears or lacerations. The edges are mostly irregular in shape. There is usually more underlying tissue damage. These wounds are often contaminated with germs; the risk of infection is high. This type of wound sometimes has less bleeding but is usually very painful.

e. Puncture wounds: Puncture wounds are caused by stabs or sharp instruments like knives, daggers or nails. These wounds typically have a smaller opening but may reach deep into the tissue. These may not be very painful. A stab wound is a puncture wound by a knife or sharp blade. A gunshot wound is a wound caused by a bullet or missile driven into the body. The entry wounds of gunshot wounds are mostly small and neat. If the projectile also exits the body, the exit wound may be large and ragged.

f. Amputation: Amputation is the removal of a limb by trauma. Re-attachment of amputated limbs, fingers or toes might be possible if the injured and the amputated part(s) arrive at the hospital as soon as possible.

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Complications of Wounds

Wounds can cause two great dangers:

1. Bleeding: Bleeding is the immediate complication of a wound and must be treated immediately.

2. Infection: Germs are tiny, not visible to the human eye, organisms that can cause diseases. Germs are bacteria, viruses, fungi and protozoa. An infection is caused by germs getting into the body through the broken skin. The germs multiply in the wound and make it 'infected', also called 'septic'. Germs may later get into the bloodstream and cause a septicaemia.

A wound is initially not infected, even though it may be contaminated by dirt or materials that contain germs. Infection occurs after a lapse of time when the germs have time to multiply and invade the tissues. This time varies with the number of germs and their virulence and the body's resistance to fight back. Pus formation is part of the body's method to fight an infection. The prevention of infection is very important. The first step consists of personal hygiene and the washing of your hands prior to and after taking care of a person.

SMALL CUTS AND ABRASIONS

Even if the injured person has a small cut or abrasions, you will still need to take care of the wound to stop the bleeding and prevent infection.

You might observe the following signs on a person with a cut or abrasions:

1. The skin or the tissue is damaged,
2. Open skin or tissue might be bleeding,
3. The bleeding might be minor or profuse,
4. The skin might be discoloured, or
5. The casualty might feel pain.

What to do

1. Follow proper hygiene
2. Try to stop or slow down the bleeding press on the wound with a clean cloth or bandage.
3. If possible, ask the injured person to press on the cut or graze himself to stop the bleeding.
4. Rinse out the wound with clean water. You can also use boiled and cooled water.
5. Pour water on the wound until you cannot see any foreign material left in the wound.
6. If necessary, wash out the wound under running water.
7. In the event the wound is bleeding profusely, do not waste time cleaning it. Your priority is to stop the bleeding by applying pressure on the wound.
8. If you have a piece of clean (cotton) cloth, then cover the wound with it.

6. To stop bleeding, ask the injured to sit or lie down or put him in a comfortable position.
7. Try to stop or slow down the bleeding; press with both hands on the wound with a clean cloth or bandage. Alternatively, if possible, ask the injured to press on the bleeding wound himself to stop the bleeding.
8. If you have a piece of clean (cotton) cloth, then cover the wound with it.
9. You can also wrap a bandage around the wound to slow down the bleeding, but continue to apply pressure until the bleeding stops.
10. Make sure the bandage is firm enough so it stops the bleeding but does not cut off all the blood flow.
11. If the part of the body below the bandage changes colour or is swelling or the injured person says he is losing any feeling there, loosen the bandage a little but do not remove it.
12. If the blood flow to a limb is stopped, an injured person can lose his limb.
13. Do not apply a tourniquet or fix a bandage above the wound, except:
 - if the bleeding of an external limb cannot be stopped by putting direct pressure on the wound, or
 - if there are many casualties you have to give help to, and
 - the first aider has been well trained on how to apply a tourniquet.
 If a tourniquet is applied on a bleeding limb:
 - apply it above the wound,
 - note down the time when the tourniquet is applied,
 - maximally, have a tourniquet applied for 2 hours,
 - transfer the casualty as quickly as possible to a healthcare facility for further treatment.
14. If the bandage becomes soaked in blood, do not remove it, but add another bandage on top of it and continue to apply pressure.
15. Take off jewels or anything else in the area of the wound that may cut off blood flow because of swelling.
16. Keep the injured person warm by taking off wet clothing, covering him with a blanket or other covering, taking care not to overheat him.
17. Keep checking for the bleeding and also check that the person is conscious and breathing properly.
18. Stay with the person until medical help is available.
19. Do not give the injured person anything to eat or drink.
20. Arrange transport to the nearest healthcare facility.
21. If the person loses consciousness but is breathing, put him in the recovery position and cover him with a blanket or coat to keep him warm. Continue to put pressure on the wound to stop the bleeding.
22. If the victim stops breathing, start CPR.

If an object is stuck in the wound : Do not remove the object. Check if the object caused an additional exit wound if it passed through; try to stop the protruding object from moving (do not remove the object) with bulky material and bandages. Build up padding around the object until you can bandage over it without pressing down. Bandage the material above and below the object with a piece of clean (cotton) cloth or improvise with other materials.

In case of internal bleeding :

Ask the injured person to sit or lie down or make him comfortable. Check the airway, breathing and circulation. If the person stops breathing, start CPR.

Do not apply hot water bottles or ice bags to the chest or the abdomen. The person needs to be transported urgently to the nearest healthcare facility.

Always seek medical help in the following situations :

1. The wound is large and/or bleeding profusely;
2. You cannot stop the bleeding;
3. The injured person lost a lot of blood;
4. An object is in the wound;
5. The wound has an irregular shape;
6. The wound is open;
7. The injured person is losing feeling or has problems moving the body part;
8. The injured person feels sick, has fainted or lost consciousness;
9. The condition of the person worsens;
10. The wound is on the face, is on or near the eyes, or in the area of the sex organs;
11. The colour of the wound or limb changes;
12. The wound has faeces or urine in it;
13. The wound was caused by a bite (from a human or an animal);
14. The wound was caused by stabbing or a bullet;
15. The injured person has diabetes or immunity affecting disease;
16. The injured person is 65 years old or older; or
17. It is more than 10 years since the injured person last had a tetanus toxoid injection

Important facts to remember :

- The heart is a muscular organ that works like a pump and is situated at the centre of the chest cavity.
- Heart is divided into four chambers- Right Atrium, Right Ventricle, Left Atrium and Left Ventricle.
- Blood purification process includes giving up carbon dioxide and taking oxygen from fresh air, which comes from the breathing process.
- Beating of the heart creates pressure in the arteries. When the heart contracts, the pressure in the arterial system increases. When the heart relaxes, the pressure in the arteries decreases.
- The carotid artery in the neck is a major artery near the heart.
- Pulse rate in a normal resting adult is between 60 and 100 beats per minute.
- Tachycardia refers to the heart beating too fast at rest - over 100 beats per minute.
- Blood is a type of body fluids that circulates in a closed system formed by the heart, the arteries, capillaries and the veins.
- An average adult has a volume of five to six litres of blood which constantly circulates.
- The blood contains red colour cells called haemoglobin which carries oxygen.
- White blood corpuscles WBC plays a role in the defence of the body against infections while platelets help the blood to clot.

Diagnosing a heart attack may not be easy, even for a trained medical professional. Extra alarm bells to make you consider a heart-related problem are:

1. The pain remains longer than 15 minutes.
2. The pain is provoked by effort (exertion pain).
3. There is relief when resting.
4. The person is known to have cardiac problems or has been prescribed cardiac medicines.

Signs of heart attack :

1. Discomfort, tightness or pain in the chest;
2. Pain spreading to the shoulder, neck, jaw, arm or stomach;
3. The pain might be described as of a dull, heavy or tight character;
4. Dizziness and fainting;
5. Sweating;
6. Difficulty in normal breathing;
7. Nausea and vomiting; or
8. Distress.

What to do :

1. Make sure there is no danger to you and the person.
2. Shout or call for help if you are alone.
3. Make the person lie down in a comfortable position, or propped up position if lying down is not possible. A semi-reclined position is often the most comfortable for such cases.
4. Ask him to rest and not move. He should rest wherever he is at the moment.
5. Loosen tight clothing for more comfort.
6. Reassure the person and tell him what is happening.
7. Ask if the person is taking medication for his heart condition. If so, allow the person to take the prescribed medication.
8. If the patient has prescribed nitro-glycerine with him, it is safe for him to take up to three doses.
9. If there is aspirin available, ask the person to chew on an aspirin tablet and swallow it with some water afterwards. Tell him that this will help the blood flow to the heart.
10. Arrange urgent transport to a nearby healthcare facility or hospital.
11. Keep observing the person in case he collapses.
12. Put the person in the recovery position if he is breathing but unconscious.
13. Perform CPR when the person stops breathing.

BLEEDING

Blood circulates in blood vessels (arteries, veins, and capillaries). When a blood vessel is damaged, several mechanisms are activated to control blood loss. The vessel constricts, and a series of chemical reactions occur to form a blood clot as a "plug" over the damaged area. If blood vessels are torn or severed, uncontrolled blood loss may occur before clotting can take place, and shock may develop.

Types of Bleeding

A bleeding can be classified by the type of the blood vessel that has been damaged:

a. Arterial bleeding : Arteries carry bright red oxygen-rich blood under pressure from the heart. If an artery is damaged, the bleeding may be profuse.

First Aid Related with Heart, Blood and Circulation

The blood will spurt out of it in time with the heartbeat. If a main artery is severed, the blood may jet several feet high. In this case, the volume of the circulating blood will fall rapidly.

b. Venous bleeding : The blood in the veins, having given up its oxygen into the tissues, is dark red. The blood flows under less pressure than arterial blood, but the vein walls can widen greatly and the blood can 'pool' inside them. If a major vein is damaged, the blood may gush from it profusely. Bleeding from the capillaries occurs with any wound. At first, the bleeding may be brisk, but blood loss is usually slight. A blow may rupture capillaries under the skin, causing bleeding into the tissues (bruising).

A bleeding can also be classified by its location :

a. External bleeding : If the bleeding is from the surface of the body, it is called an external bleeding.

b. Internal bleeding : If the bleeding is within the skull, chest and abdomen or inside the body, it is called internal bleeding. These bleedings might not be noticed immediately. At a later stage, blood might ooze out of the nose or ears (bleeding inside the head), be coughed up (bleeding inside the lungs), vomited or defecated (bleeding inside the digestive tract) or urinated out (bleeding inside the urinary tract).

What do I see and enquire :

A person who has an injury which is bleeding severely is in a life-threatening situation and needs immediate help. Therefore, stopping the bleeding is a core first aid activity. In addition, bleeding in the face or neck may impede the airflow to the lungs.

1. There might be an open wound that is bleeding. The bleeding might be profuse.
2. There might be an object stuck in the wound.
3. Even if you cannot see an object, there might be something stuck in the wound if :
 - The injured feels pain in a specific area;
 - The injured person reveals a painful lump;
 - The injured person feels there is something stuck in the wound;
 - There is a discoloured area where the pain is.
4. Suspect bleeding inside the body, if the injured person :
 - Is losing blood from body cavities (nose, ear(s), mouth, sex organs, anus);
 - Is breathing rapidly;
 - Has a cold and clammy skin that is pale or turns blue;
 - Has a rapid heartbeat (pulse);
 - Is behaving in an irritated or unusual way;
 - Has pain or complains about tenderness; sometimes, there is also swelling in the abdomen or chest at the place of the suspected internal bleeding;
 - Becomes sleepy or falls unconscious.

What to do in case of bleeding :

1. Make sure there is no danger to you and the person.
2. Shout or call for help if you are alone.
3. Maintain proper hygiene.
4. Put on gloves if available. You can also use a clean plastic bag.
5. Try not to come in contact with the person's blood.

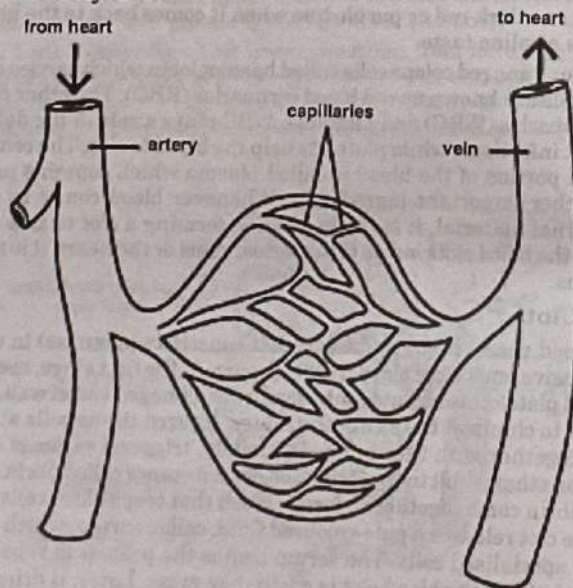
1. **Pulmonary circulation :** This part of the cycle carries oxygen-depleted blood away from the heart, to the lungs, and back to the heart.
2. **Systemic circulation :** This is the part that carries oxygenated blood away from the heart and to other parts of the body.
3. **Coronary circulation :** This type of circulation provides the heart with oxygenated blood so it can function properly.

Pulmonary Circulation : The pulmonary artery is a vessel that carries blood from the heart. It splits into the left and right pulmonary arteries, which carry blood with relatively low oxygen content and high carbon dioxide content to the lungs. There, it is replenished with inhaled oxygen and excess carbon dioxide is dropped off to be released from the body via exhalation.

SYSTEMIC CIRCULATION

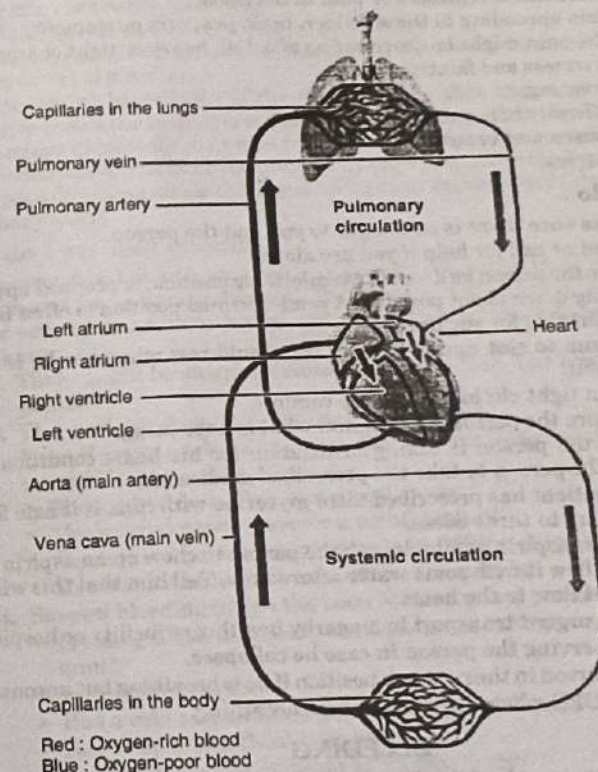
The passage of blood from the heart through the body to deliver oxygen and nutrients to the body's tissues while returning deoxygenated blood to the heart is known as systemic circulation. The pulmonary veins supply oxygenated blood to the left atrium. The blood is subsequently pushed into the left ventricle via the mitral valve. Blood is pushed from the left ventricle into the aorta, the body's biggest artery, via the aortic valve. Before passing through the diaphragm, the aorta branches into main arteries that supply the upper body before continuing on to the iliac, renal, and suprarenal arteries, which supply the lower body.

Smaller arteries, arterioles, and finally capillaries branch from the arteries. The capillaries that pass through the tissues are where gas and nutrient exchange takes place. Metabolic waste and carbon dioxide leave the cell and enter the blood, whereas oxygen and glucose from the blood leave the blood and enter the cell. Except for the parenchyma of the lungs, which is supplied by pulmonary circulation, systemic circulation maintains the metabolism of every organ and tissue in the body alive.



The deoxygenated blood continues through the capillaries which merge into venules, then veins, and finally the venae cavae, which drain into the right

atrium of the heart. Blood will move from the right atrium to the pulmonary circulation to be oxygenated before returning to the system circulation, completing the body's circulation cycle. The highest blood pressures in the body are found in the arterial component of systemic circulation. Due to their distance from the heart, the venous component of systemic circulation has significantly lower blood pressure, but contains semilunar valves to compensate. Because systemic circulation must pump greater volumes of blood farther through the body than pulmonary circulation, systemic circulation has a higher overall pressure than pulmonary circulation.



CHEST DISCOMFORT

Like all body organs, the heart also needs blood to function properly. If someone complains of chest discomfort, it may be a sign that not enough blood is flowing to the heart muscles. This is very serious and can indicate that the person may suffer from a heart attack. A heart attack happens when there is a blockage of the blood flow to some parts of the heart muscle. In that case, a part of the heart muscle starts to die as soon as that region does not get any blood supply. It is serious even if the sick person says that nothing is wrong with him. When a person complains of chest pain, always suspect an impending heart attack. However, not every chest discomfort or pain is a heart attack. Several other less problematic health problems present with similar symptoms.

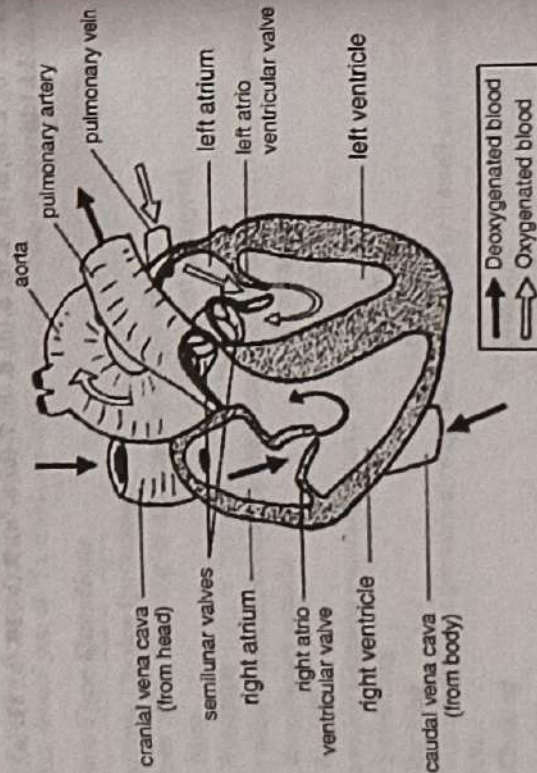
CHAPTER 7

FIRST AID RELATED WITH HEART, BLOOD AND CIRCULATION

THE HEART

The heart is a muscular organ that works like a pump and is situated at the centre of the chest cavity. It pumps the blood. It is divided into four chambers and the mechanism is as follows :

- 1. Right Atrium :** The right upper chamber receives impure blood from all parts of the body through blood vessels called veins.
- 2. Right Ventricle :** The right lower chamber, when the heart contracts (the heart beats) the impure blood enters here and finds its way to lungs where it is purified. Blood purification process includes giving up carbon dioxide and taking oxygen from the fresh air that comes from breathing process.
- 3. Left Atrium :** Left upper chamber is called the left atrium. The purified blood enters here and passes to the left lower chamber.
- 4. Left Ventricle :** Left lower chamber, from here, the purified blood is discharged into various blood vessels called arteries and capillaries, which carry this purified blood for the nourishment of the body as a whole, including heart muscles. Thus, each heart is in fact, two pumps put together.



Blood Pressure : Bending of the heart creates pressure in the arteries. When the heart contracts, the pressure in the arterial system increases. When the heart relaxes, the pressure in the arteries decreases. The pressure exerted on the main arteries is known as the blood pressure and is recorded by a blood pressure measuring instrument.

Pulse : With each heartbeat, blood is ejected into the arterial system. Most of the arteries are placed deep in the body, except on the wrist, elbow, neck, groin and ankle. So, arterial pulse is normally felt over the lateral side of the wrist, in the neck, groin and near the ankle. Sometimes, when the person is in shock, we cannot find arteries even at these sites. The carotid artery in the neck is a major artery near the heart. Feeling the pulse is a difficult task that requires training. Pulse rate in a normal resting adult is between 60 and 100 beats per minute. Tachycardia refers to the heart beating too fast at rest - over 100 beats per minute.

THE CIRCULATORY SYSTEM

The blood circulatory system (cardiovascular system) delivers nutrients and oxygen to all cells in the body. It consists of the heart and the blood vessels running through the entire body. The circulatory system consists of four major components: heart, arteries, veins and blood. The arteries carry blood to the heart; the veins carry it back to the heart. There are three different types of circulation that occur regularly in the body.

THE BLOOD

Blood is a type of body fluids that circulates in a closed system formed by the heart, the arteries, capillaries and the veins. An average adult has a volume of five to six litres of blood which constantly circulates. The blood is a thick viscous liquid of bright red or scarlet colour when it flows from the heart to the arteries and takes a dark red or purple hue when it comes back to the heart via the veins. It has a saline taste.

The blood contains red colour cells called haemoglobin which carries oxygen. The red blood cells are known as red blood corpuscles (RBC). The other cells are white blood corpuscles (WBC) and platelets. WBC plays a role in the defence of the body against infections, while platelets help the blood to clot. The remainder yellowish liquid portion of the blood is called plasma which contains proteins, enzymes and other important ingredients. Whenever blood comes in contact with some external material, it tends to solidify, forming a clot to stop further bleeding. When the blood clots inside the arteries, veins or the heart, it is referred to as a thrombus.

How Blood Clots

When a blood vessel is cut or damaged, it constricts (narrows) in order to prevent an excessive amount of blood from escaping. At the first stage, specialized blood cells called platelets come into contact with the damaged vessel wall, become sticky and start to clump at the site of the injury. Injured tissue cells at the site of the wound, together with the clumped platelets, trigger a series of complex chemical reactions that result in the formation of a substance called fibrin. Strands (filaments) of fibrin come together to form a mesh that traps blood cells to make a blood clot. The clot releases a pale-coloured fluid, called serum, which contains antibodies and specialised cells. The serum begins the process of repairing the damaged area. At first, the blood clot is a jelly-like mass. Later, it dries out into a crust (scab) that seals and protects the site of the wound until the healing process is complete.

air. An asphyxiant gas is usually a non-toxic or minimally toxic gas which displaces the normal oxygen concentration in breathing air. Because asphyxiant gases are relatively inert and odourless, their presence in concentrations may not be noticed sometimes.

Toxic gases, by contrast, cause death by other mechanisms, such as competing with oxygen at the cellular level (e.g., carbon monoxide) or damaging the respiratory system. Even smaller quantities of these gases can be deadly. Carbon monoxide (CO) is a colourless, odourless, and tasteless but toxic gas which takes the space in haemoglobin that normally carries oxygen, thus making it ineffective in delivering oxygen to body tissues. Carbon monoxide is produced when there is not enough oxygen to produce carbon dioxide (CO₂) such as when operating a stove or an internal combustion engine in an enclosed space. Carbon monoxide is lighter than air.

Carbon dioxide (CO₂) is a colourless, odourless gas that is heavier than normal air. It can be pocketed in high concentrations in wells, sewerage mines. Other gases like refrigerator gases compressed gases for cooking or lighting can also cause suffocation.

What to do in case of suffocation by smoke :

1. Shout or call for help if you are alone.
2. Protect yourself with a towel or a cloth (preferably wet) over your mouth and nose.
3. Crawl on the floor and stay as low as possible.
4. Move the victim as quickly as possible away from the area.
5. Loosen the victim's clothes at neck and waist.
6. If the breathing stops, call for help and start CPR.
7. Always arrange transport for the victim to a healthcare facility for further follow up.

What to do in case of suffocation by carbon monoxide (CO) or lighter than air :

1. Safety first shout or call for help
2. The fire brigade has specialized teams and equipment to handle these situations safely.
3. If the gas is expected to be a deadly poisonous gas, do not enter the affected area!
4. Ensure the circulation of fresh air by opening doors and windows
5. Before entering the enclosed space, take two or three deep breaths and hold your breath as long as you can.
6. Use a gas mask if available.
7. Crawl on the floor and stay as low as possible.
8. Move the victim to an area of fresh air away from the affected area
9. Loosen the victim's clothes at neck and waist.
10. If the breathing has stopped, call for help and start CPR.
11. Always arrange transport for the victim to a healthcare facility for further follow up.

What to do in case of suffocation by carbon dioxide (CO₂) or heavier than air :

1. Follow all the above points except enter in upright position and stay high as possible.

Asthma

Asthma is a condition in which the person's airways become narrow and swell and produce extra mucus. This can make breathing difficult and trigger coughing, wheezing and shortness of breath. For some people, asthma is a minor nuisance. For others, it can be a major problem that interferes with daily activities and may lead to a life-threatening asthma attack. Asthma may not be cured, but its symptoms can be controlled. Person may be known to have asthma and prescribed medications. This can be established by taking history from the casualty. Following signs can be seen in a person having an asthma attack :

1. The person has difficulty in breathing.
2. The person experiences as if he does not get enough air.
3. Sometimes, the person breathes rapidly or coughs. In some cases, he coughs up mucus.
4. The breathing makes a whistling or wheezing sound when exhaling.
5. The person complains of tightness or pain in the chest.
6. The person has troubled sleeping due to the shortness of breath.
7. Symptoms of asphyxia (grey-blue tinge of lips and nail-beds).
8. If the attack lasts long, exhaustion may occur.

What to do :

1. Stay calm and reassure the person.
2. Let the person adopt a position that he finds most comfortable. In many cases, this is sitting up in bed or on a chair, leaning forward on a couple of pillows or a small table on which he rests his head.
3. Do not make the person lie down. However, it is important that the person adopts the position that he finds best.
4. If the person is used to take inhaler puffs for his condition, let him take the medication.
5. Ensure fresh air by opening a window. Loosen any tight clothing.
6. If it is the first attack or the attack is severe or the inhaler puffs have no effect, seek urgent medical help in a healthcare facility.
7. If the person loses consciousness, make sure the airway remains open and check the breathing.
8. If the person stops breathing, start CPR.
9. Always advise the person known to be treated for asthma to visit the healthcare facility as soon as possible after the asthma crisis for further follow-up and treatment.

Important facts to remember :

- During breathing, air containing oxygen enters the lungs and when we breathe out, air containing waste products is removed from the lungs.
- Respiration is defined as the transport of oxygen from the outside air to the cells within the body tissues, and the transport of carbon dioxide (a waste product) in the opposite direction.
- The respiratory system includes the air passage, two lungs and respiratory muscles





If the person is still choking :

1. Stand behind the choking person and put both hands around him, your hands meet in front of the person.
2. Make a fist and place it between the navel and lower tip of the breast bone of the person. Hold onto this fist with your other hand.
3. Bend the choking person forward and pull your fist firmly towards the person's back and upwards.
4. Give five abdominal thrusts. This method of abdominal thrusts can only be used on people older than one year.
5. If the passage of air is free, stop giving further abdominal thrusts. Always stop after five abdominal thrusts.
6. If the object does not come out and the person is still choking, give another five blows on the back followed by five abdominal thrusts.
7. Repeat this until the object is released or until the choking person loses consciousness.



If the person loses consciousness :

1. Carefully place the unconscious person on the floor.
2. The person urgently needs help. Shout or call for help.
3. Start CPR. Follow standard procedure.

What to do if the choking person is a baby under the age of one year :

1. Kneel down so that you can use your thighs to prevent the baby from falling.
2. Lay the baby down along your forearm.

3. Support the baby's head and neck with one hand without covering the mouth so the baby lies face down, with the baby's head below his trunk, over your forearm, supported by your thigh.
4. With your free hand, give five firm blows with the base of your palm to the area between the baby's shoulder blades.
5. Quickly turn the baby, while supporting the head, onto his back to face you, resting on your arm.
6. Check if the object has come out and the baby can breathe freely.



If the object does not come out :

1. Place two fingers (the two after your thumb) in the middle of the baby's chest and deliver five thrusts (pushing inwards and upwards). This method of chest thrust is only to be used on babies under the age of one year.
2. Stop after five thrusts.
3. If the object does not come out and the baby is still choking, give another five blows on the back followed by five thrusts.
4. Repeat this until the object is released or the choking baby loses consciousness.

If the baby loses consciousness :

1. Lay the baby down on the floor or a hard and safe surface.
2. Start CPR.
3. Arrange hospital transport immediately.

Swelling within the throat

A swelling in the throat may occur as a result of drinking a very hot liquid, swallowing corrosive poisons, inflammation or an allergic reaction. The swelling may obstruct the free airway to the lungs.

What to do :

1. Make the victim sit up.
2. If the breathing is restored to normal, you can give ice to suck on or some cold water to sip.
3. If the breathing stops, call for help and start CPR.

Suffocation by smoke or gases

Asphyxia can occur in an environment where there is air contamination such as excessive smoke or can occur in case of breathing in the oxygen-depleted

The signs of drowning :

- No breathing or difficult breathing;
- Restlessness;
- Rate of breathing increases;
- Breaths get shorter;
- Veins of the neck become swollen;
- Face, lips, nails, fingers and toes turn blue;
- The pulse gets faster and
- Water may gush from the mouth. This water is from the stomach and should be left to drain on its own. Do not attempt to force the water come out of the stomach as the victim may inhale it.

What to do in case of drowning :

1. Safety first and call for help.
2. Remove the person rapidly and safely from the water.
3. Try to throw a rope or something that the drowning person can hold onto
4. Once the person has been rescued from the water, do not try to remove water from his lungs.
5. If the person is breathing, put him in the recovery position and cover him with a blanket or coat to keep him warm.

If the casualty is not breathing or not breathing normally, then :

1. Remove any cause of suffocation.
2. If the person is not on his back, turn him on his back.
3. Kneel down by the side of the person.
4. Start CPR. Follow standard procedure
5. Arrange urgent transport to a hospital.

Strangulation and Hanging

Strangulation is a constriction or squeezing around the neck or throat. If airway is squeezed if pressure is exerted on the outside of the neck and by this act, the flow of air into the lungs is cut off. Hanging is the suspension of the body by a tie around the neck. Hanging or strangulation may occur accidentally, for example, by ties or clothing becoming caught in machinery. Hanging may cause a broken neck. For this reason, the casualty must be handled extremely carefully.



The symptoms are same as signs of asphyxia. If you find the absent breathing or hard breathing, follow the given protocol-

What to do :

1. Safety first, call for help
2. Cut or remove the band constricting the throat.

3. If the victim is suspended, raise the body and loosen or cut the rope.
4. Lay the person carefully on the ground.
5. Follow the standard procedure to bring the person to normal condition by recovery position.
6. If there is no breathing follow the standard procedure of CPR and
7. Arrange for shifting to the hospital as soon as possible.
8. Do not wait for the police to arrive, but give first aid immediately.
9. Do not interfere or destroy any material or evidence.

Choking

When a person is having severe difficulty in breathing because of an obstructed airway or lack of air, he is choking. Coughing is the natural way of clearing the airway when the person experiences mild choking. It is also a sign that he still gets air through the windpipe. Severe choking happens when the foreign object or a local swelling blocks the airway. This is a life-threatening emergency.

Infants and small children often choke after swallowing some non-edible objects like coins, marbles, seeds, buttons or small toys.

Signs of Choking :

1. Difficulty in breathing,
2. He/She tries to cough something out, but it does not help,
3. He/She cannot speak or make any sound,
4. He/She puts his hands on his throat,
5. The lips and tongue turn blue,
6. The veins in the face and neck stick out, or
7. The person becomes dizzy and might lose consciousness.



What to do :

1. If the age is more than one year, ask the person to keep coughing.
2. Do not do anything else, but stay with the person until he breathes normally again.

If the person cannot speak, cough or breathe :

- Stand to the side and a little behind the choking person or child (aged older than one year) Support the person's chest with one hand and bend him forward.
- Give five firm blows between the person's shoulder blades. To do so, use the heel of your free hand.
- Verify if the object has come out and the person can breathe again.

separates the chest from the abdominal cavity. Intercostals and abdominal muscles also, help in this process.

Mechanism of Respiration

Breathing the air in is called inspiration and breathing out is called expiration. During inspiration, the diaphragm flattens and increases the capacity from above downwards. The ribs move upwards and forward, increasing the capacity of the chest cavity from front to back by the action of the muscles situated between the ribs. The lungs thus expand and air enters them. This is an active process. During expiration, the diaphragm comes back to its original position and the ribs fall back, thus forcing the air out of the lungs. This is a passive process.

There are small blood vessels called capillaries; surrounding the alveoli. The exchange of oxygen and carbon dioxide takes place through the blood circulating in these capillaries. Oxygen is absorbed by the red blood corpuscles of the blood and water vapour and carbon dioxide are let out from the blood plasma into the alveoli and expelled out. In the lungs, there are nerves that are connected to an area in the brain called the respiratory centre. This centre controls the respiration.

FIRST AID RELATED WITH RESPIRATORY SYSTEM

No Breathing or Difficult Breathing

A person can only survive a few minutes without breathing. *Asphyxia* is a condition in which the lungs do not get sufficient supply of air for breathing. If this continues for some minutes, the breathing and heart action stops and death occurs.

Causes of No Breathing : There may be various causes for no breathing or difficult breathing. Some most common causes are as follows :

- Foreign body inhalation- as a coin inhaled by a child or artificial tooth by an adult;
- Food going down the air passage;
- Seaweeds, mud or water getting into the air passage during drowning;
- Bronchial asthma;
- Tongue falling back in an unconscious person;
- Inhaling irritant gases (coal gas, motor exhaust fumes, smoke, sewer gas and closed granary gas or gas in a deep unused well, etc.);
- Smothering such as covering of the face and nose of an infant or an unconscious person lying face downwards on a pillow, or having a plastic bag covering the face of the victim,
- Tying a rope or scarf tightly around the neck causes strangulation,
- Hanging or throttling (applying pressure with fingers on the windpipe);
- Diseases like Epilepsy, tetanus, rabies, nerve diseases causing paralysis etc.;
- Poisonous bites (e.g. snake bites like the cobra);
- Overdose of morphia or similar products such as sleeping tablets;
- Electric shock, stroke;
- Low atmospheric pressure where the oxygen level in the atmospheric air is low.

The signs of no breathing are :

1. There is no flow of air out of the nose or mouth if we listen and feel the airflow and

2. The chest of the victim does not move up and down.

Note that even after breathing has stopped, the heart may continue to beat for a short while. If you find a person who is not breathing or not breathing normally, you can increase his chances of staying alive by giving rescue breaths (CPR).

Signs of asphyxia are :

- Difficulty in breathing and signs of restlessness;
- The rate of breathing increases;
- The breaths get shorter;
- The veins of the neck become swollen;
- The face, lips, nails, fingers and toes turn blue; and
- The pulse gets faster and feebler.

What to do if there is no breathing or abnormal breathing :

1. Safety first and call for help
2. Secure an open airway and start CPR
3. If the breathing starts :
 - a. Keep the victim covered to keep him warm.
 - b. Arrange urgent transport to a hospital.
 - c. Do not leave the victim alone and continue to observe him.
- d. If the breathing stops, restart CPR.
- e. Always urgently transport the person to the nearest hospital continuing CPR.

Drowning

Drowning happens generally when a person is swimming or diving. It causes asphyxia (no breathing or difficult breathing) by water, weeds and mud entering into the lungs. When the lungs' alveoli are filled with water, they cannot exchange oxygen to and from the blood. 'Dry drowning' is a condition when water never reaches the lungs, but breathing in water causes the vocal cords spasm that shuts off his airways, making it hard to breathe. Another condition is known as 'Secondary drowning', where swimmer often appears fine immediately after swimming. But over time, water left in the swimmer's lungs begins to cause oedema or swelling. If a casualty has been immersed in cold water, there is also danger of hypothermia. It is important to keep the victim warm. If the casualty was diving, there is a risk of trauma to the head, neck or spine.



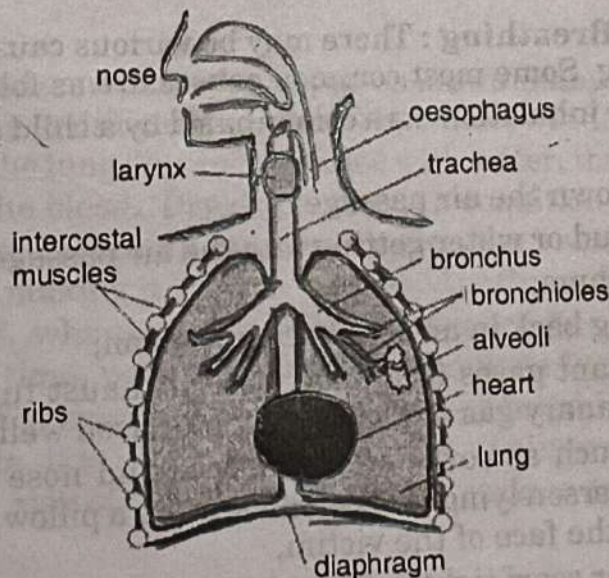
CHAPTER 6

FIRST AID RELATED WITH RESPIRATORY SYSTEM

RESPIRATION

We all know that Oxygen is essential to life, which we take in while breathing. During breathing, air containing oxygen enters the lungs and when we breathe out, air containing waste products is removed from the lungs. In each inspiration, we take approximately 500 cc of air in. Respiration is defined as the transport of oxygen from the outside air to the cells within the body tissues and the transport of carbon dioxide (a waste product) in the opposite direction.

The Respiratory System



SCHEMATIC DIAGRAM OF LUNGS AND THORAX

The Air Passages : Nose, throat (pharynx), windpipe (trachea) and air-tubes (bronchi) make the air passage. The bronchi are divided into many minute branches (bronchioles), which end in the lung substance (alveoli).

The Lungs : Two lungs are situated on the right and left sides of the chest cavity. Lungs are made up of a number of small sacs, called alveoli. The lungs are covered by a membrane called 'pleura', which lines the inner wall of the chest cavity.

The Respiratory Muscles : The respiratory muscles help to contract and expand the lungs to facilitate the breathing. Diaphragm is the muscle that