



The Skeletal System: Structure, Function, and Importance

Fatemeh Hajibabae*

Department of Anatomy, Wakayama Medical University, Wakayama, Japan

*Corresponding Author's E-mail: hajemnalhofateme@yahoo.com

Received: 20-February-2025, Manuscript No. jmms-25-162243; **Editor assigned:** 24-February-2025, PreQC No. jmms-25-162243 (PQ); **Reviewed:** 11-March-2025, QC No. jmms-25-162243; **Revised:** 14-March-2025, Manuscript No. jmms-25-162243 (R); **Published:** 24-March-2025, DOI: 10.14303/2141-9477.2025.143

INTRODUCTION

The skeletal system is a vital framework of the human body that provides structural support, facilitates movement, and protects internal organs. Composed of bones, cartilage, ligaments, and joints, this complex system plays a crucial role in maintaining overall health and function. Understanding the skeletal system's anatomy, physiology, and common disorders helps in appreciating its significance in daily life and medical science.

DESCRIPTION

Anatomy of the skeletal system

The human skeletal system consists of 206 bones, categorized into two main parts:

Axial skeleton

The axial skeleton includes 80 bones forming the central core of the body, providing protection and support. It comprises:

- **Skull:** Encases the brain and consists of cranial and facial bones.
- **Vertebral column:** Composed of 33 vertebrae, it provides structural support and flexibility.
- **Rib cage:** Includes 12 pairs of ribs and the sternum, protecting vital organs like the heart and lungs.

Appendicular skeleton

The appendicular skeleton consists of 126 bones that aid in movement. It includes:

- **Upper limbs:** Humerus, radius, ulna, carpals, metacarpals, and phalanges.
- **Lower limbs:** Femur, tibia, fibula, patella, tarsals, metatarsals, and phalanges.
- **Pectoral girdle:** Clavicle and scapula, connecting arms to the torso.
- **Pelvic girdle:** Ilium, ischium, and pubis, supporting the lower body and aiding in movement.

Functions of the skeletal system

The skeletal system serves several crucial functions essential for survival and mobility:

Support and structure

Bones provide a rigid framework that maintains the shape of the body and supports soft tissues, including muscles and organs.

Protection of vital organs

The skull shields the brain, the rib cage protects the heart and lungs, and the vertebral column safeguards the spinal cord.

Movement and locomotion

Bones act as levers, and joints function as pivot points, allowing movement in coordination with muscles and tendons.

Blood cell production (Hematopoiesis)

Red and white blood cells are produced in the bone marrow, ensuring a steady supply of oxygen-carrying cells and immune system components.

Mineral storage and release

Bones store essential minerals such as calcium and phosphorus, releasing them into the bloodstream when needed for metabolic functions.

Fat storage

Yellow bone marrow contains adipose tissue, which stores fats that serve as an energy reserve for the body.

Types of bones

Bones can be categorized based on their shape and function:

- **Long bones:** Found in limbs (e.g., femur, humerus), they provide strength and mobility.
- **Short bones:** Found in the wrists and ankles (e.g., carpals, tarsals), they provide stability and support.
- **Flat bones:** Protect vital organs (e.g., skull, ribs, scapula) and serve as muscle attachment sites.
- **Irregular bones:** Have unique shapes suited to their functions (e.g., vertebrae, pelvis).
- **Sesamoid bones:** Small bones embedded in tendons (e.g., patella) that aid in joint function.

Joints and connective tissues

Joints are the points where two or more bones meet, allowing movement and flexibility. They are classified as follows:

- **Fibrous joints:** Immobile (e.g., skull sutures).
- **Cartilaginous joints:** Slightly movable (e.g., intervertebral discs).
- **Synovial joints:** Freely movable (e.g., knee, shoulder, hip).

Connective tissues, including ligaments, tendons, and cartilage, support joint function and movement. Ligaments

connect bones, tendons attach muscles to bones, and cartilage cushions joints.

Bone development and growth

Bone formation (ossification) occurs in two primary ways:

- **Intramembranous ossification:** Direct formation of bone tissue (e.g., skull bones).
- **Endochondral ossification:** Replacement of cartilage with bone (e.g., long bones).

Bone growth continues throughout childhood and adolescence, influenced by hormones like growth hormone, estrogen, and testosterone.

Common skeletal disorders

Several disorders affect the skeletal system, impacting mobility and overall health. Some of the most common conditions include:

Osteoporosis

A condition characterized by decreased bone density, making bones fragile and prone to fractures. It commonly affects older adults, especially postmenopausal women. Prevention includes adequate calcium and vitamin D intake, weight-bearing exercise, and medication when necessary.

Arthritis

Inflammation of joints, leading to pain and stiffness. Types include:

- **Osteoarthritis:** Degenerative joint disease due to wear and tear.
- **Rheumatoid arthritis:** An autoimmune disorder causing joint inflammation.
- **Gout:** Caused by uric acid buildup in joints.

Fractures

Bone breaks caused by trauma, overuse, or underlying conditions like osteoporosis. Types include:

- **Simple (Closed) fracture:** Bone remains within the skin.
- **Compound (Open) fracture:** Bone pierces through the skin.
- **Stress fracture:** Small cracks due to repetitive stress.

- **Greenstick fracture:** Common in children, where the bone bends and partially breaks.

Scoliosis

A condition where the spine curves abnormally, affecting posture and balance. Treatment may involve bracing or surgery in severe cases.

Rickets and osteomalacia

Both conditions result from vitamin D deficiency, leading to soft and weak bones. Rickets affects children, while osteomalacia occurs in adults.

Maintaining skeletal health

Ensuring a healthy skeletal system requires a combination of lifestyle habits and medical care. Key practices include:

Balanced diet

Consuming calcium-rich foods (dairy products, leafy greens, nuts) and vitamin D sources (sunlight, fish, fortified foods) promotes strong bones.

Regular exercise

Weight-bearing exercises like walking, jogging, and strength training help maintain bone density and prevent osteoporosis.

Proper posture and ergonomics

Maintaining good posture and using ergonomic furniture reduces stress on the skeletal system.

Avoiding smoking and excessive alcohol: Tobacco and alcohol use can weaken bones and increase the risk of fractures.

Regular check-ups: Routine bone density tests and medical evaluations help detect and manage skeletal disorders early.

CONCLUSION

The skeletal system is essential for movement, protection, and overall health. Understanding its structure and functions allows individuals to take preventive measures to maintain strong bones and joints. Advancements in medical science continue to improve the diagnosis and treatment of skeletal disorders, ensuring better mobility and quality of life for people of all ages. By adopting a healthy lifestyle and seeking timely medical care, individuals can keep their skeletal system functioning optimally throughout their lives.