

Skeletal Anatomy in Unani Medicine: A Critical Analysis of *Izā'm* (bones) in Classical Texts

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Abstract

Classical Unani literature describes *Izā'm* (bones) as the foremost among the *A'dā' Mufrada* (simple organs), serving as the essential foundation of the human body. Their hardness and dryness are considered natural qualities that enable bones to bear weight, provide structural support and protect delicate organs such as the brain, heart and lungs. Although bones are recognized as the coldest and driest tissues. Unani scholars note that they contain enough moisture to allow nourishment and sustain life. Bone classification differs among early authorities: Galen divided bones into long and flat, whereas later Unani physicians categorized them into four types long, flat, short and irregular. Vesalius advanced anatomical understanding by identifying cortical and cancellous regions, marrow-filled cavities and the periosteum that supplies sensation. Avicenna similarly distinguished compact from spongy bone and emphasized the role of marrow in moderating bone dryness created by movement. Unani scholars outlined several key functions of bones: enabling controlled motion, providing pathways for vaporous waste, protecting vital organs, supporting variations in organ size, stabilizing body structures and coordinating joint movements. Classical texts report varying bone counts from 242 to 248 based on differing inclusion of teeth, sesamoid bones and ear ossicles contrasting with the modern adult count of 206 bones after natural fusion. The significance of bones is further shown in their role in waste ventilation. Skull bones contain fine openings and sutures that allow vapours to escape, safeguarding the brain. Large bones such as the femur and tibia are hollow and contain nourishing marrow, facilitating both strength and efficient movement.

Keywords: *Izā'm*, *A'dā' Mufrada*, Mizāj, Quwwat-e-Tabī'yah, Anatomy.

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INTRODUCTION

Izā'm (Bones) has been classified among the *A'dā' Mufrada* (Simple Organs). In all the *A'dā' Mufrada* (Simple Organs) the bone comes first because it is like a foundation that is why it has been placed first.[1-4]

Izā'm (Bones) are the hardest and driest parts of an animal's body. Their hardness and dryness have been granted for two beneficial reasons.

- The first benefit is that bones serve as the foundation and pillars upon which all bodily organs rely. Since all body parts are placed upon bones, they act as a base and a support structure. For anything to bear

weight, it must be stronger and more solid than the load it carries.[5]

- The second benefit of their hardness is that, in certain places, bones are required to act as a shield for delicate organs, such as the skull for the brain and the ribs for the chest. Anything meant to provide protection must be strong enough to withstand impacts and resist damage.[6]

Bones are harder than all other parts because of it is coldest and driest part of body. However, its dryness is less than that of hair, because bone becomes nourishment for the living body and nourishment can only form the body if it contains moisture.[7]

OBJECTIVES

- To analyze *Izā'm* (bones) in classical Unani texts, assessing its anatomical accuracy and relevance to modern osteology.
- To describe key terminologies, classifications, functional importance of *Izā'm*, and its applied aspect from texts like *Al-Qānūn fī al-Ṭibb*, *Al-Hāwī*, and *Kitāb al-Taysīr fī'l Mudāwā wa'l Tadbīr*.

METHODS

This study employs a qualitative, desk-based textual analysis method that emphasizes hermeneutic interpretation of primary Unani sources. The primary sources examined include significant core texts such as *Al-Qānūn fī al-Ṭibb*, *Kitāb al-Hāwī*, *Kitāb al-Taysīr fī'l Mudāwā wa'l Tadbīr*, *Kitāb al-Mi'a*, *Qānūncha*, *Kāmil al-Ṣanā*, and *Kitāb al-Kulliyāt*. Additionally, secondary sources consist of contemporary academic resources that encompass scholarly journals, research articles, modern publications, and references such as Standard Unani Treatment Guidelines for Common Diseases, CCRUM and Unani pharmacopeia.

Classification of Bones

Galen classified the bones based on their being long and flat but all other Unani physicians classified bones based on their shapes. It is of four types:

- Long bones:** which have two ends (upper and lower) and a central shaft such as the thigh bone (femur) and the arm bone (humerus).
- Flat bones:** such as the shoulder blade (scapula) and the bones of the pelvis.
- Short bones:** like the bones of the wrist and ankle.
- Irregular bones:** such as the vertebrae (bones of the spine).[8,9]

Vesalius observed that every bone consists of a dense outer layer (cortical) and an inner, spongy part (cancellous), the latter containing hollow spaces filled with marrow that helps nourish the bone. He also noted that nearly all bones are encased in a membrane known as the periosteum which plays a role in providing sensation.[10]

Avicenna stated that bones and cartilage serve to support and shield the body's structures and vital organs, in addition to aiding movement. He made a clear distinction between compact and spongy (or cancellous) bone types. According to his description, compact bones consist of a hard outer layer, known as cortical bone and a central cavity containing marrow. Within the framework of Tib theory which attributes a cold and dry temperament to bones he noted that bone marrow plays a role in supplying moisture, helping to offset the dryness that results from physical exertion.[11]

Functional Importance of Bones

The body's structure consists of numerous bones, each varying according to necessity. There are six reasons for this necessity:

1. Movement: The hardness of bones benefits movement, as an animal need to move certain parts of their body while keeping others still. For instance, a person may move both hands or feet, or just the head. Sometimes, only a portion of a limb moves while the rest remains stationary, like moving the palm while keeping the wrist still or moving fingers while keeping the palm steady. Therefore, limbs meant for movement required multiple bones instead of a single one.[6]

2. Evaporation of bodily waste: Bones play a role in expelling vaporous waste from the body. The abundance of bones was necessary because the waste materials accumulating in the body come from various bodily organs. Some waste is thick and dense, while some is subtle and vaporous. For the thick waste, specific pathways were created so it could descend and exit in a way that its release is perceptible. On the other hand, vaporous waste naturally rises and dissipates throughout the body.[6]

For this reason, bones were designed with fine channels, allowing the vaporous waste to exit imperceptibly. Similarly, the skin was also made with tiny pores to release these vapors, much like steam escaping. For instance, the skull has such perforations because the head is the highest part of the body, where vapours from all organs rise.[6]

The head is like the ceiling of a house where a fire is burning just as smoke blackens the ceiling, vapors from the body rise toward the skull. Hence, there was a need for numerous openings in the bones of the skull to constantly expel these vapours. This was essential for protecting the brain and its surrounding tissues from harmful substances.[6]

For this reason, the bones of the skull were made in multiple parts and joined together with seams called sutures, ensuring both protection and ventilation.

3. Protection from external harm: Different bones provide protection against external injuries that might otherwise damage vital organs.⁶

4. Size variations of organs: The presence of different bones helps to accommodate the varying sizes of body parts. The bone and the shinbone were made hollow inside because they are large in size and require frequent and rapid movement. The marrow inside these hollow bones serves as their nourishment.[6]

5. Support and stability: Bones help secure and reinforce the body's structure, keeping organs in place.[6]

6. Coordination of movement: The interconnected bones allow smooth and controlled motion throughout the body.[6]

Due to these reasons, bones are structured in a way that supports both movement and protection, ensuring the body functions efficiently.[6]

Vesalius made significant contributions to anatomical science, particularly through his first book, which focused on the skeletal system. The significance of his work was clear from the first chapter, where he compared the human skeleton to the structural elements of buildings and ships likening bones to the walls and beams of a house and that keels and ribs play in ship.[10]

According to Vesalius, bones served different purposes in the body: some acted as supports, others functioned as shields for delicate structures and certain ones were positioned near joints to limit extreme movement. He described sesamoid bones named for their resemblance to sesame seeds as playing a role in regulating joint motion.[10]

Vesalius not only confirmed that bones protect and support, he affirmed Galen's view that bones provide protection and structural support but he expanded on this by emphasizing their role in facilitating and regulating movement. In addition, while Galen maintained that bones are entirely solid Vesalius challenged this belief with his own observations.[11]

Bones Count and Distribution

The human skeleton initially consists of approximately 270 bones at birth, but this number decreases to 206 in adulthood as some bones gradually fuse over time. For instance, the five sacral vertebrae found in children eventually merge to form a single sacrum in adults.[12]

The human body contains a total of 242 bones and their function is to strengthen and protect the human body. The correct opinion is that excluding the ear bones, the hyoid bone, and the bone in the heart, the total number of bones is 248 without counting those which include 11 large bones of the head, including those of the skull, 16 large bones of both jaws, 32 teeth, 30 vertebrae of the neck and back, 2 collar bones (clavicles), 2 shoulder bones (scapulae), 2 humerus bones (upper arms), 60 large bones in both arms, 24 bones of the ribs, 7 bones of the chest, 2 hip bones, 60 large bones in both legs.¹³ This is the view agreed upon by the Shaykh and the *Abu Sehel Maseehi*, but according to the author of *Qanoocha*, the total number of bones is 242.[13]

The human skeleton has a total of 246 bones, Details of the bones are as follows: 8 bones of the skull, 14 bones of the face, 1 Hyoid bone (at the root of the tongue), 32 teeth (upper and lower), 6 bones of the ears (both sides), 26 vertebrae or spinal bones, 2 collar bones

(both sides), 1 sternum (chest bone), 24 ribs (both sides) 2 shoulder bones (one on each side), 2 arm bones (one on each side), 4 forearm bones (two on each side), 16 wrist bones (8 on each side), 10 palm bones (5 on each side), 28 finger bones (14 on each side), 2 hip bones (both sides), 2 bones of the tongue (both sides), 4 shin bones (both sides), 14 ankle bones (both sides), 10 heel bones (both sides), 28 toe bones, 8 tiny bones like sesame seeds (sesamoid bones).[9]

Unani scholars have recorded different totals for the number of bones in the human body. While modern anatomy recognizes 206 bones in adults due to bone fusion, Unani sources suggest counts ranging from 242 to 248. Some, like the Shaykh and *Abu Sehel Maseehi*, include structures such as the teeth, sesamoid bones, and ear ossicles, arriving at a higher total. Others, like the author of *Qanoocha*, maintain a count of 242. These variations reflect the detailed anatomical knowledge and differing classification methods used in traditional Unani medicine.

Diseases and Disorders of the Skeletal System in Unani Medicine

Classical Unani literature emphasizes the importance of humoral equilibrium, temperament (*Mizāj*), and natural faculty (*Quwwat-e-Tabī'yah*) in preserving bone health and offers a thorough and comprehensive understanding of disorders affecting the skeletal system (*Izā'm*). According to *Ibn Zuhr*, bones can experience various disorders, categorized as *Sū"-i-Mizāj* (morbid temperament), *Tafarruq-i-Ittiṣāl* (loss of continuity), constitutional diseases (*Amrād-i-Shakl*), proximity disorders (*Amrād al-Waḍ*), and size-related diseases (*Amrād al-Miqdār*). These ailments arise due to the intrinsic temperament of bones, which are essential for sustaining human beings at any age. Every organ, whether muscular, nervous, vascular, membranous, or cutaneous, is subject to this assessment. Disease can disrupt the normal physical state of bones, highlighting the significance of understanding their temperament across various dimensions. Any defects in the interconnectivity of bones should prompt efforts to restore them to their natural physical characteristics.[14]

Kasr (Fracture)

The term "*Kasr*" refers to the discontinuity or fracturing of bones, which can occur due to trauma, excessive physical exertion, or intrinsic fragility of the bone tissue. Scholars in Unani medicine propose that this condition arises when there is a predominance of cold, damp humors, especially *Balgham*, or when the bones lack adequate nourishment; leading to their brittleness.[15] Poor bone strength is also a result of weak natural faculties and impaired digestion. Manual realignment (*Radd-e-Kasr*), immobilization with bandages and splints, and topical use of healing ointments are all part of treatment. To speed up bone regeneration, strengthening medications (*Muqawwiyāt-*

e-Iḍā'm) and nutrient-rich meals that include milk, meat soup, and eggs are recommended.[16]

Layaan ul Iḍām (Osteomalacia)

Osteomalacia, or *layaan ul Iḍām*, refers to the softening of bones, commonly occurring during pregnancy. It leads to bones becoming soft, delicate, and light, increasing their susceptibility to fractures from minimal impact. This condition can cause spontaneous fractures due to muscle action because essential minerals that contribute to bone hardening are depleted, resulting in a higher fat content in the bones.[17] The disease typically progresses gradually, to the extent that bones can become so soft they can be cut with a knife in just a few days. Additionally, the periosteum, the membrane

surrounding the bones, may become soft, thick, and inflamed, appearing filled with dark fluid. Ultimately, osteomalacia can affect the entire skeletal system or stabilize at a point where only specific affected bones harden abnormally.[17]

Taḥajjur al-Mafāṣil (Ankylosis)

Ankylosis is a condition characterized by the stiffening of joints where the movement of the bones becomes halted.[17,18] This condition results in significant joint stiffness and the formation of nodes, leading to restricted and painful movements. The primary cause of ankylosis is the chronicity of arthritis and its management.[18]

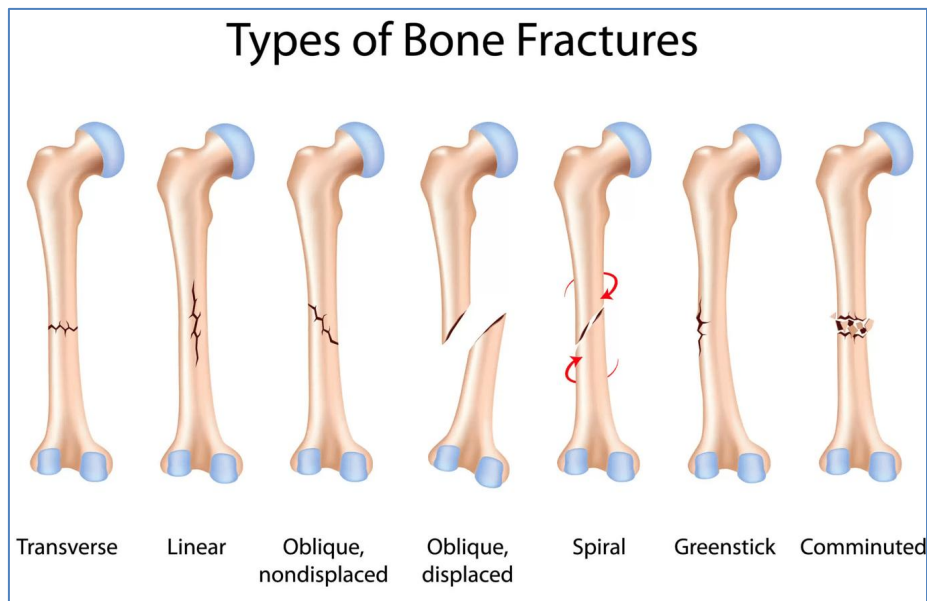


Figure: 1

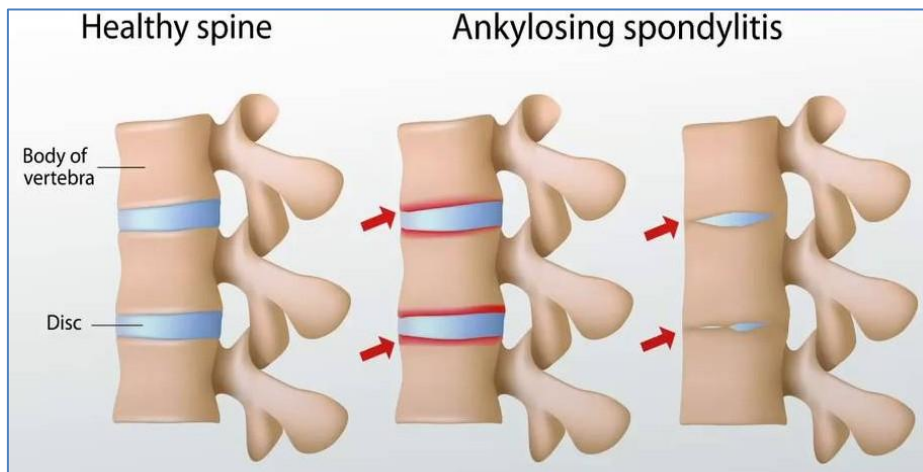


Figure: 2

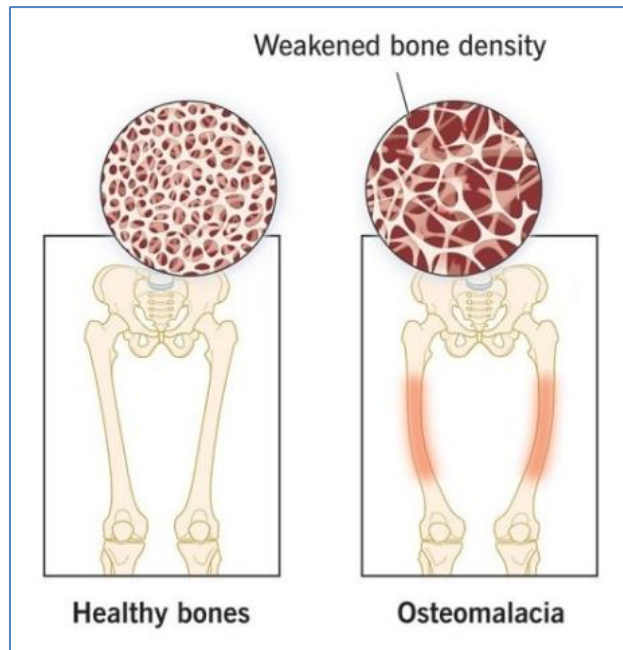


Figure: 3

DISCUSSION

Classical Unani literature presents a comprehensive yet humoral-based understanding of *Izā'm* (bones), emphasizing their hardness, dryness and foundational role in the body. Scholars viewed bones as essential for support, protection and movement connecting their physical properties to the cold and dry temperament associated with stability and strength. While much of this framework is rooted in Tib theory many observations such as the protective role of the skull and ribs or the need for multiple bones to allow controlled movement align with modern anatomical principles.

The classification of bones shows both continuity and refinement across time. Galen's early distinction based on length evolved into the four-type classification used widely in Unani medicine closely resembling modern categories. Contributions from Vesalius and Avicenna introduced more detailed structural insights, including cortical and cancellous bone, marrow and the periosteum marking a shift toward empirical anatomy.

Differences in recorded bone counts (242–248) reflect varying methods of including teeth, sesamoid bones, and small ossicles. These variations highlight the detail-oriented nature of traditional anatomists, even though they differ from the modern count of 206 bones in adults. The classical explanation that bones contain fine channels for releasing vaporous waste illustrates the humoral physiology of the time. While not aligned with modern science, it demonstrates how scholars sought logical reasons for anatomical structures such as sutures and hollow long bones.

CONCLUSION

Classical Unani literature offers a clear and structured understanding of *Izā'm* (bones), emphasizing their role in support, protection and movement. Although framed within humoral theory, many observations such as bone hardness, marrow function and the need for multiple bones align with modern anatomical knowledge. Differences in bone classifications and counts reflect the evolving and detailed nature of early anatomical study. While certain concepts, like vaporous waste escaping through sutures, are outdated, they show sincere efforts to explain structure through available theory. Overall, Unani scholars contributed significantly to early anatomical understanding, forming a foundation that later anatomists further developed.

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