

## **1. Cause of the Proposal:**

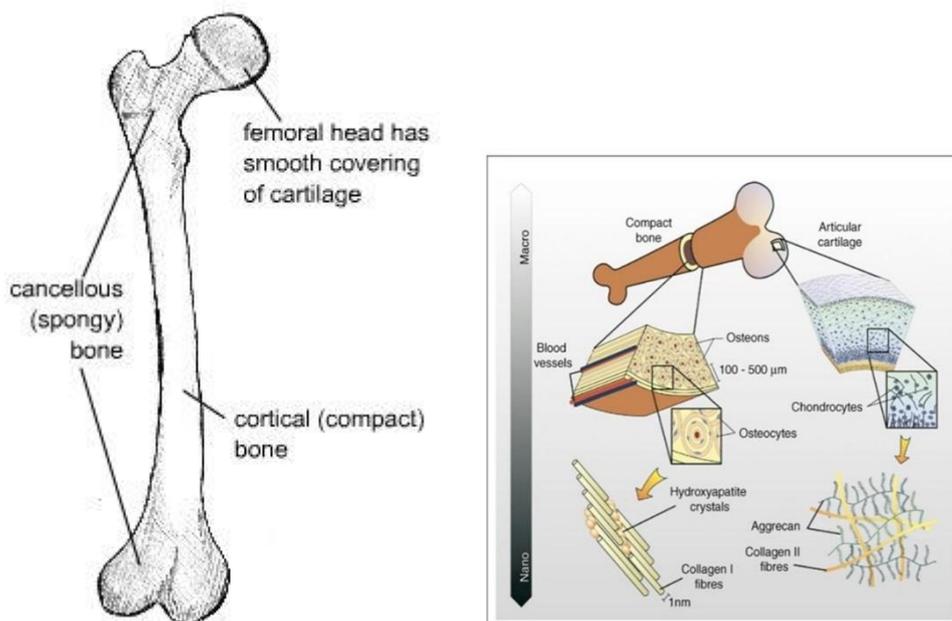
Worldwide, as from the report up to the year of 2019, there were 178 million new bone fractures cases were reported which was an increase of around 32-34% since from, 455 million prevalent cases of severe or long-term indications of bone fracture (an increase of 70.1% [67.5–72.5] since 1990). Hence, muscular medical procedures require the requirement for the development of novel biomedical implants and prosthesis with multifunctional properties as the substitution of harmed bone tissues. Metals were one which possessing good mechanical properties acts as a best choice to be used as muscular implants. Even though, the absence of osteoinductive properties, lower corrosion resistance, poor antimicrobial efficiency, low blood bio compatibility and exemplification by stringy tissues requests metallic implants surface to be incorporated with multifunctional bioactive materials. Henceforth, improving surface bioactivity was main focus of the recent researchers to be focused on the fabrication of bio ceramic coatings on metallic substrates. Recent scientists and researchers were in the expedition of originating a highly impactable biomaterial or implant material for bone tissue engineering applications having multifunctional roles likely, improved bioactivity, high biocompatibility with very low toxicity to human cells and good mechanical strength.

## **2.Importance of the proposed plan**

In the past decade, numerous researchers were attempted to design the bio functional ceramic coatings by varying and compositing the biologically and chemically derived materials exhibiting multifunctional roles, mechanical strength, improved osteoinductive and osteointegration activity, higher corrosion resistivity, excellent antimicrobial efficiency, high blood bio compatibility and low cyto-toxicity etc. Furthermore, previous studies suggested that lack of any of these properties not make the fabricated material as an effective and ideal candidate or biomaterial for bone tissue engineering applications. Hence, our proposal work

addressing into the development and design of more effective metallic biomaterials which can be effectively utilized for orthopaedic repair and replacement.

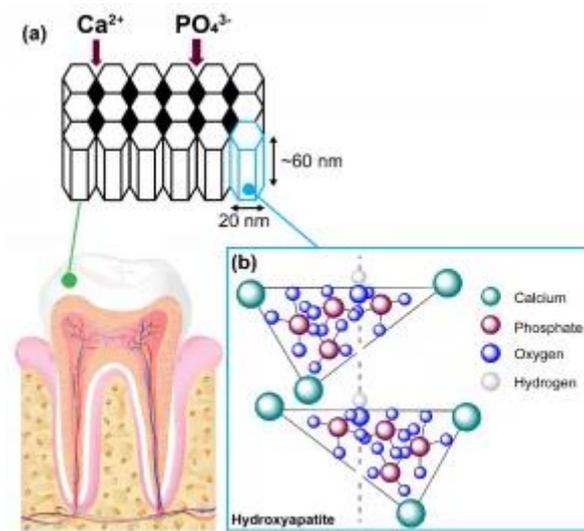
Bone is a heterogeneous composite material made up, in decreasing order, of a mineral phase called hydroxyapatite ( $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ ) (analogous to geologic "hydroxyapatite"), an organic phase made up of water, about 90% type I collagen, 5% noncollagenous proteins (NCPs), and 2% lipids by weight, and hydroxyapatite ( $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ ), Proteins with specialised functions, such as those that I regulate collagen fibril diameter, (ii) serve as signalling molecules, (iii) serve as growth factors, (iv) serve as enzymes, and (v) have other functions can also be divided into two categories: structural proteins (collagen and fibronectin) and non-structural proteins.



**Fig.1.** Human Bone Composition

Excellent biocompatibility, lack of toxicity, lack of an inflammatory response, and formation of a chemical bond with natural bone (osteoconductive), calcium phosphate-based bio ceramics like hydroxyapatite [ $\text{HAP: Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ ] have shown significant potential applications in

orthopaedics and dentistry. Physically and chemically, synthetic HAP is similar to the material found in human bone and teeth.



**Fig.2.** Hydroxyapatite in Bone