The Estimation of Bone Mineral Density (BMD) for the Detection of Osteoporosis in Elderly Women using clinically practised DEXA images

Osteoporosis is a medical condition, in which the bones become brittle and fragile as a consequence of the loss of tissues. It is typically accelerated due to hormonal changes or deficiency of calcium or vitamin D. The main cause of osteoporosis is a significant drop in the estrogen levels of the body. Estrogen is the hormone that helps build and maintain bones. The primary reason for the decrease in the level of estrogen in women is menopause. That is why elderly women, in postmenopausal age, are mostly affected by osteoporosis.

Osteoporosis makes the bones of the hip, wrist and spine more prone to the risk of fracture and also cause architectural defects. The image of a healthy bone resembles a healthy honeycomb structure but the osteoporotic bone displays much larger holes and spaces in the honeycomb structure, whereas, osteopenia is a medical condition in which the mineral content of the bone undergoes reduction but less severely than in osteoporosis.

Osteoporosis is found in elederly throughout the world with all most uniform frequency. It is almost prevalence in females and poses a global concern. Resultantly, it needs meticulous investigation for the prevention and early detection as well. That is why it is imperative to find out the ways and means to have pinpointed approach for the diagnosis of the onset of osteoporosis.

Initially, various bone densitometry methods were used to evaluate the stage of osteoporosis, namely morphometric and photon absorptiometry methods, e.g., radiographic absorptiometry, radiogrammatery, Single-Photon Absorptiometry (SPA) and Dual Photon Absorptiometry (DPA) etc. In some of the cases, these were digitised, still, they suffer from one of the other infirmities. These methods were time consuming, expensive, non-economic and lacked the anticipated accuracy and precision. Finally, the investigators ushered into an era of DEXA (Dual Energy X-Ray Absorptiometry). The state-of-the-art DEXA proved to be a reliable diagnostic tool and also came into use for the detection and forecast of the risk of bone fracture in an unambiguous pathway . The DEXA uses X-Ray beams of two peak energies. It has been employed for the measurement of Bone Mineral Density (BMD), which determines the T-Score suggestive of Osteoporotic condition. The digitised DEXA image using an appropriate application of a suitable image processing algorithm is still desirable and needs extensive exploration.

Keeping in mind the aforesaid current status of literature, the objectives of the research proposal are stated here:

1)To acquire DEXA clinical dataset to analyse and quantify, the level of osteoporosis, occurring in any part of the body of elderly women

2)To create a repository/atlas of the results of the quantification of various patients affected by Osteoporosis, isosynchronously, by the use of DEXA image results.

3)To provide decision support to the orthopaedician to intensify the level of treatment /therapy for the elderly women, patients to cure osteoporosis.

Research Plan:

Semester 1	**Coursework, Survey of Literature, Discussions**
Semester 2	**Algorithm 1 Implementation, Paper 1 Publish**
Semester 3	**Algorithm 2 Implementation, Paper 2 Publish**
Semester 4	**Algorithm 3 Implementation, Paper 3 Publish**
Semester 5	**Write Thesis**
Semester 6	**Thesis Submit**