# Major Depression Induced Endocrine Modulation is a Risk Factor for Low bone Mineral Density in Premenopausal Women

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## Abstract

**Background:** The significant physiological effects of psychological depression are beginning to be recognized as exacerbating common diseases, including osteoporosis. This review discusses the current evidence for psychological depression-associated mental health disorders as risk factors for osteoporosis, the mechanisms that may link these conditions, and potential implications for treatment

Osteoporosis is a major public health threat and depression is second most important cause of disability worldwide in 2020. Several studies have reported an association between depression and low bone mineral density, but a causal link between these two conditions is disputed.We propose that depression induces early bone loss in premenopausal women, primarily via specific endocrine mechanisms associated poor lifestyle habits contributory.

**Aim and Objectives:** To find the clinical correlation between depression, serum cortisol, vitamin D, hypothyroidism and BMD in Premenopausal Women.

To find out a new risk factor of secondary osteoporosis in premenopausal women.

**Methods:** The study group consisted of 80 osteoporotic female patient's age range between 30-60years.The state of depression was analyzed by using Ham D scale. BMD and endocrine parameters was measured by DEXA and chemiluminisence,ELISA. Statistical correlation analyzed by SPSS22software.

**Results:** A highly significant ($P < 0.00001$) correlation was observedbetween HAM-D score and serum cortisol. The correlation between HAM-D and BMD was also significant ($P < 0.05$).No significant correlation was found between BMD and serum cortisol ($P > 0.05$).The correlation of serum vitamin D with BMD was far more significant ($P < 0.00001$) compared to the association with TSH ($P < 0.0001$).

**Discussion & Conclusion:** A high score of depression associated with low vitamin D level or high serum cortisol and TSH level which is a risk factor for low BMD in premenopausal women to develop secondary osteoporosis

It can be concluded that Irrespective of the specific causes, subjects with depression should be considered for screening for bone mineral density and, vice versa, subjects with low BMD should be considered for screening for depression in early stage of life and supplementation of vitamin D with regular physical activity in premenopausal women for prevention of secondary osteoporosis.

***Keywords:*** *BMD, Cortisol, Depression, Premenopausal women, Vitamin D, secondary osteoporosis.*

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## Introduction or background

Emerging evidence points to the potential pathological impact of mental health on disease. It has

long been held that depression has negative impacts on health and disease risk, but the specific mechanisms, by which this occurs, as well as implications for treatments and clinical recommendations, have not been examined in-depth. In this review, we first highlight mechanisms that impact both bone health and mental health toward identification of potentially overlapping signaling pathways. We then review current literature regarding the impact of common life style modification for treatment of osteoporosis -+and mental health disorders to promote recognition of the potential interaction of these therapeutic agents in patients with concurrent mental health disorders and osteoporosis to encourage a broad view of disease management toward improved patient health. Finally, we provide a perspective outlook on the potentially Provisional beneficial effects of alternative treatments, such as exercise and nutritional supplementation, on both osteoporosis and depression.

***Rationale*:**

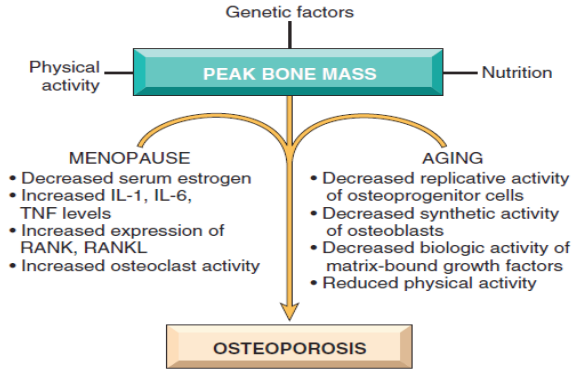
- Prognosis for osteoporosis treatment is poor.

- The rationale of this study is to ascertain the mode of action of depression in lowering the BMD in premenopausal women and whether life style modification can be a prophylactic measure.

Osteoporosis is the most common form of metabolic bone disease and is characterized by low bone mass and micro-architectural bone deterioration. The World Health Organization defines osteoporosis as a bone mineral density (BMD) that is ≤2.5 standard deviations below peak bone mass, which is typically achieved around age 30. In the United States alone, osteoporosis accounts for over 1.5 million fractures per year [1]. By 2025, treatment costs are estimated to exceed $25 billion [2]. Osteoporosis is characterized by an imbalance of skeletal remodeling, resulting in increased osteoclast activity and/or decreased numbers of osteoblasts, which can lead to decreased bone strength and mass, as well as increased susceptibility to fracture.

Osteoporosis is an umbrella term for a group of distinct pathological conditions and has been traditionally classified into primary and secondary types based on mechanism of disease [3]. There are two main types of primary osteoporosis: type I osteoporosis and type II osteoporosis. The theoretical framework in figure 2 depicts the type I osteoporosis occurs most frequently in postmenopausal women and primarily results from estrogen deficiency. Type II osteoporosis is associated with aging and is commonly observed in men and women after the age of 60. Secondary osteoporosis is characterized by bone loss resulting from an underlying etiology, such as Cushing's syndrome, or prolonged treatment with glucocorticoids.

In glucocorticoid-induced osteoporosis, bone loss occurs within several months of glucocorticoid treatment. Excess glucocorticoids exert an inhibitory effect on osteoblast differentiation [4]. Glucocorticoid-induced osteoporosis is the most common form of secondary osteoporosis and is the most common form of osteoporosis among young people (reviewed in [5]. Secondary osteoporosis can also be caused by disuse.




In acute psychological and physical stress, stress signaling is initiated through the hypothalamic-pituitary-adrenal (HPA) axis and the sympathomedullary (SAM) pathway via secretion of stress hormones, which include glucocorticoids (cortisol) and catecholamines (epinephrine, norepinephrine).

Psychological stress can have lasting impact on risk for development of comorbid disease, as well as significant impact on pre-existing diseases. In regard to osteoporosis, U.S. military veterans diagnosed with PTSD have a higher risk of developing osteoporosis [6].

**Material and Methods:**

- An Observational - cross sectional study was conducted on 80 osteoporotic patient's age range 30-60 years in department of Physiology in collaboration with Orthopaedic OPD in KPCMCH, Kolkata.

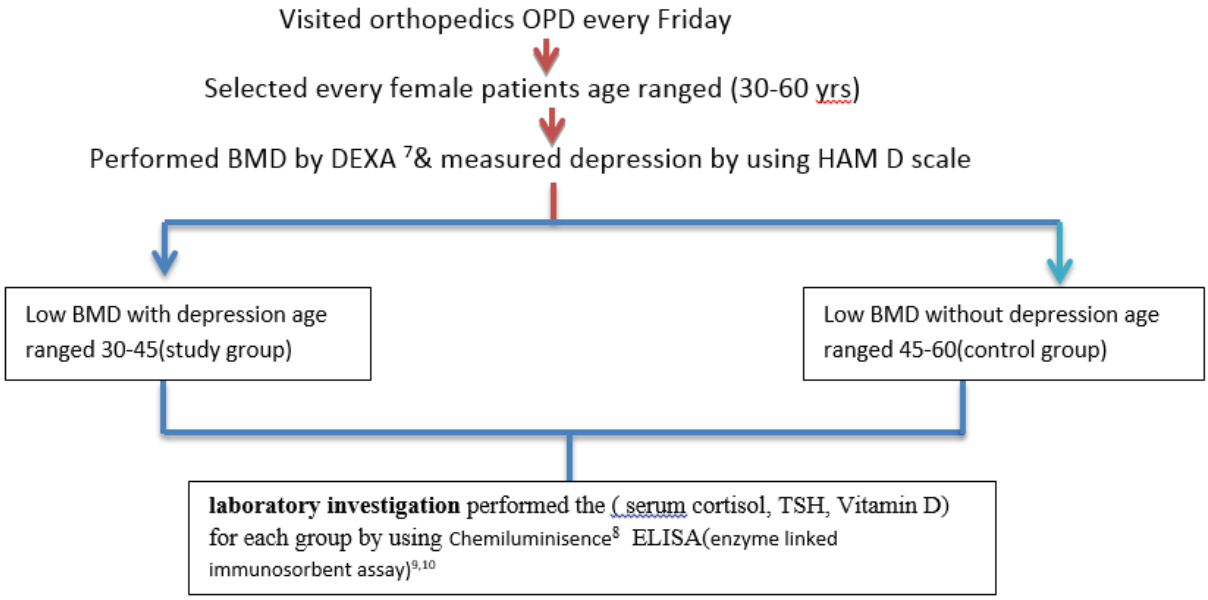
- Institutional ethical clearance was obtained and

inclusion, exclusion criteria decided.

Visited orthopedics OPD every Friday

Selected every female patients age ranged (30-60 yrs)

Performed BMD by DEXA [7]& measured depression by using HAM D scale



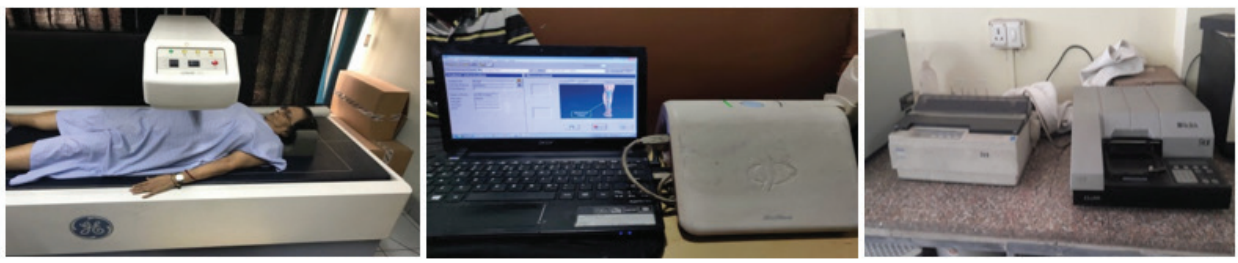



**Figure: DEXA(dual energy X-ray absorptiometry ,Ultrasound & ELISA (enzyme linked immunosorbent assay )**

**Statistical Analysis:** The results were expressed as mean ± SD. P <0.05 was considered as significant. One way ANOVAand correlation analysis was applied. Statistical analysis done by using the software GRAPHPAD PRISM Version 5.00 March 7, 2007

## Findings

Scatter diagram 1- 5 showing correlation coefficient between these different endocrine variables with depression and bone mineral density in premenopausal women.

Scatter diagram 1- 4 showing correlation coefficient between these different endocrine variables with depression and bone mineral density in postmenopausal women.

## Discussion

Scatter diagram 1- 5 showing correlation coefficient between these different endocrine variables with depression and bone mineral density in premenopausal women.

- In scattered diagram no 1 showed the

correlation between HAM-D and BMD showed R=-0.257(moderately negative correlation) and statistically also significant (P <0.05).

- A highly significant (P <0.00001) correlation was observed between HAM-D score and serum cortisol which showed a moderately positive correlation with R value of 0.57 in scattered plot no 2.

- No significant correlation was found between serum cortisol and BMD (P> 0.05) which showed R= -0.16 in scattered plot no 3.

- Last scattered plot no 4 & 5 showed the correlation of serum vitamin D with BMD was far more significant (P<0.00001) compared to the association with TSH (P<0.0001) although vitamin D is negatively correlate (R= 0.23) whereas TSH is moderately positive correlation(R= 0.51) with BMD.

Scatter diagram 1- 4 showing correlation coefficient between these different endocrine variables with depression and bone mineral density in postmenopausal women.

- BMD is reduced consequently due to aging leading to primary osteoporosis in postmenopausal women.

- As the correlation between HAM-D and BMD showed R=-0.15 which is a negligible correlation in scatter plot no2 as well as no such relation also not find out between Cortisol

with BMD in postmenopausal women in scattered plot no 3.

- Scattered plot 4 & 5 showed the correlation of serum TSH with BMD was far more significant (P<0.00001) compared to the association with vitamin D (P<0.0001) although vitamin D is negatively correlate (R= 0.24) whereas TSH is positive correlation(R= 0.62) with BMD in postmenopausal women.

## Conclusion

In the present study it was found that premenopausal women suffering secondary osteoporosis with reduced BMD due to depression induced necrosis of osteoblast and inhibits differentiation and bone mineralization associated with altering different endocrine parameters specially vitamin D.

On the other hands primary type 1 osteoporosis occurs most frequently in post menopausal women were sufferings due to estrogen deficiency which may affects both bone resorption and bone formation not altering endocrine parameters as such in our present study.

It can be concluded that Irrespective of the specific causes, subjects with depression should be considered for screening for bone mineral density and, vice versa, subjects with low BMD should be considered for screening for depression in early stage of life and supplementation of vitamin D with regular physical activity in premenopausal women for prevention of secondary osteoporosis.

**Conflict of Interest:** The authors declare no conflict of interest.

**Source of Finding:** Self

**Ethical Clearance:** Certificate taken.

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