

# Incidence and Risk Factors for Low Bone Mineral Density in Inflammatory Bowel Disease

Low Bone Mineral Density in Inflammatory Bowel Disease

Imran Arshad, Shaista Zeb, Ehsan Rahim Memon and Prem Kumar

## ABSTRACT

**Objective:** Inflammatory bowel disease often causes osteoporosis. Inflammatory bowel disease patients' BMD falls due to clinical causes (IBD). Despite little data, BMD prevalence and risk factors are poorly known. Thus, this research investigated IBD's low BMD prevalence and causes.

**Study Design:** Cross-sectional study

**Place and Duration of Study:** This study was conducted at the Isra University Hospital's Gastroenterology Department included 65 adult ulcerative colitis patients from August 2021 to July 2022.

**Materials and Methods:** Patients' ages, BMIs, illnesses, sex, sickness durations, vitamin D levels, and steroid use histories were recorded. Dual-energy X-ray absorptiometry evaluated lumbar and femur bone mineral density (DEXA). Bone metabolism biochemical markers included deoxypyridinoline, serum calcium, osteocalcin, and phosphorus. Low bone mineral density was compared to medications, steroid usage, disease duration, age, and body mass index. SPSS 25 analyzed the data.

**Results:** The diagnosis of ulcerative colitis was made in 30 women (46.2% of the total) and 35 males (53.8% of the total). 38.6 3.54 years. 68.9% (n=45) had abnormal bone mineral density. 35.4% and 33.8% of 45 individuals with abnormal BMD had osteoporosis and osteopenia. Steroid use and illness duration substantially correlated with low bone mineral density in univariate analysis. Poor bone mineral density predicted disease duration in multivariate studies. Poor BMD was unrelated to age, body mass index, gender, vitamin D status, or steroid usage.

**Conclusion:** High levels of osteoporosis and osteopenia were seen in this study of people with inflammatory bowel disease. Poor bone mineral density was strongly associated with disease progression. Illness seems to be the biggest risk factor for low bone mineral density. Early detection of low MBD allows for prevention.

**Key Words:** Unknowns Inflammatory colitis, Bone deficiency

**Citation of article:** Arshad I, Zeb S, Memon ER, Kumar P. Incidence and Risk Factors for Low Bone Mineral Density in Inflammatory Bowel Disease. Med Forum 2022;33(11):32-35.

## INTRODUCTION

Inflammatory bowel disease patients had 2% to 42% osteoporosis<sup>[1,2]</sup>. In numerous studies<sup>[2,3]</sup>, inflammatory bowel disease patients had lower bone mineral density. Age, gender, body mass index, sickness duration, smoking, steroid history, and reduced food intake were negatively correlated with bone mineral density<sup>[4]</sup>. Many processes link inflammatory bowel disease to osteoporosis. Genetics, low body mass index, small intestinal resection, malabsorption, corticosteroid treatment, hypogonadism, and vitamin D deficiency may cause low bone mineral density<sup>[5-7]</sup>.

Department of Gastroenterology, Isra University Hospital, Hyderabad.

Correspondence: Imran Arshad, Assistant Professor of Gastroenterology, Isra University Hospital, Hyderabad.

Contact No: 0333 4116553

Email: doctorimranarshad@gmail.com

Received: August, 2022

Accepted: September, 2022

Printed: November, 2022

Crohn's disease increases bone mineral density risk. Crohn's disease may be diagnosed with low bone density. Crohn's disease patients with low bone mineral density demonstrated a greater connection with treatment than ulcerative colitis patients<sup>[8]</sup>. Crohn's disease is a major cause of osteopenia/osteoporosis, since azathioprine-induced remission increased BMD in patients. Steroids for low BMD may not work. Corticosteroids may lower BMD, however studies disagree<sup>[9]</sup>.

Research on low bone mineral density has shown conflicting results (BMD). Jahsen et al.<sup>[10]</sup> observed no association between vitamin D and BMD in 120 IBD patients. Maldonado et al.<sup>[11]</sup> observed no association between vitamin D and calcium intake and bone mineral density in premenopausal inflammatory bowel disease patients. Khadgawat<sup>[12]</sup> found a positive connection between poor BMD and calcium intake in Indian patients with inflammatory bowel disease. Despite their assumptions, steroid usage, age, and sickness duration did not affect BMD. Bishop et al.<sup>[13]</sup> found that corticosteroid usage, male gender, and inadequate vitamin D intake increased the risk for low BMD in 166 IBD patients, while age and disease site did not. Hip and vertebral fractures are prevalent in IBD

patients. Breaks may be caused by osteoporosis factors. To monitor and treat low bone mineral density, this study investigated its prevalence and causes.

## MATERIALS AND METHODS

This cross-sectional research at Hyderabad's Isra University Hospital's Gastroenterology Department included 65 adult ulcerative colitis patients from August 2021 to July 2022. Ages, BMIs, diagnoses, illness durations, vitamin D levels, and steroid use were documented. Dual-energy X-ray absorptiometry measured lumbar and femur BMD (DEXA). Deoxypyridinoline, serum calcium, osteocalcin, and phosphorus measured bone metabolism. Low bone mineral density was compared to drugs, steroids, illness duration, age, and BMI. DEXA eliminated isolated proctitis individuals without steroid history. Medical records and questionnaires provided demographic and clinical data. Endoscopic, clinical, histological, and radiographic tests identified IBD. Cancer, diabetes, chronic liver disease, pregnancy, and blood creatinine  $>1.5$  mg/dL were excluded from this research.

Conventional DEXA assessed femur and L2-4 spine BMD. BMD produced T or Z-scores. Z-scores measure standard deviations from age- and gender-specific mean values, whereas T-scores relate to a young adult's bone mass peak. The WHO distinguishes osteoporosis from osteopenia using standard deviation. Osteoporosis is a WHO-defined T score of  $-2.5$  SD, whereas osteopenia is  $-1$  SD but not  $>2.5$  SD [14]. Normal, insufficient, or deficient vitamin D 25-hydroxy levels were 20–30 ng/mL.

Comparing healthy and abnormal BMD patients (osteoporosis and osteopenia). SPSS 25 analyzed data. Low BMD was linked to illness duration, age, BMI, steroid use, gender, and vitamin D. Chi-square and Student's tests analyzed category and numeric variables. Univariate odds ratios have 95% confidence intervals.

## RESULTS

Thirty females (46.2% of the total) and thirty-five boys (53.8% of the total) were diagnosed with ulcerative colitis. 38.6 years. 68.9% ( $n=45$ ) had abnormal BMD. 35.4% and 33.8% of 45 abnormal BMD patients had osteoporosis and osteopenia. Steroid usage and illness duration were linked with poor bone mineral density in univariate analysis. Multivariate analyses predicted illness duration with low bone mineral density. Poor BMD was unrelated to age, BMI, gender, vitamin D status, or steroid use. Gender ratios. Figure 2 shows BMD abnormality. Table-I shows baseline features of DEXA-tested inflammatory bowel disease patients. Mann-Whitney.

## DISCUSSION

The study's major findings showed that inflammatory bowel disease patients had a higher risk of osteoporosis

and osteopenia. Bowel resection and corticosteroid medication most typically caused osteopenia or osteoporosis in IBD patients. Disease-related activities were independent risk factors. Similar to tertiary care referral studies, this study found higher incidence of osteopenia and osteoporosis [15]. In our study, inflammatory bowel disease patients had a higher rate of osteoporosis [16,17]. Inflammatory bowel disease patients with osteopenia and osteoporosis benefit from bisphosphonates in addition to vitamin D and calcium.

Pathological BMD in IBD patients showed that the femoral neck was less effective than the lumbar spine. Most studies show femoral neck osteoporosis is more common [18,19], yet this may not be true. Corticosteroids deplete trabecular bone. Bokemeyer et al. found reduced BMD in Chinese IBD patients [20]. In a study of 50 patients, 26 of whom had ulcerative colitis, inflammatory bowel disease patients had inadequate bone mineral density 63% more often than healthy young adults of the same age and gender. The recent study found that low bone mineral density prolonged sickness. Azuma et al. [21] found similar findings in 41 ulcerative colitis patients. Low BMI has long been linked to poor BMD. Poor BMD was not linked to BMI in this study. Asians may eat better than Westerners due to the BMI-nutrition link. In a cross-sectional study of 1250 postmenopausal women, reduced bone mineral density (BMD) was associated with higher BMI and worse socioeconomic status [22]. In this study, vitamin D levels did not affect BMD. The patient's limited capability may relate. Inflammatory bowel illness may cause vitamin D insufficiency due to poor diet, malabsorption, sun exposure, or circulation [23]. Hilmi et al. [24] observed no association between vitamin D and low BMD in 74 inflammatory bowel disease patients. Mouli et al. found that inflammatory bowel disease patients with vitamin D deficiency had low BMD [25].

In IBD patients, corticosteroids are typically utilized as first-line treatment for active BMD, which decreases intestinal calcium absorption, impairs osteoblast function, increases renal calcium excretion, and induces osteoblast death [26]. This study found no link between steroid usage and BMD. Alireza et al. [27] found a significant positive connection between poor BMD and steroid usage in 122 people with inflammatory bowel illness. Steroids cause osteopenia and osteoporosis, Abraham said. Corticosteroids have been linked to osteoporosis in Crohn's disease, and patients with abnormal BMD receive more steroids. 110 g of steroids may decrease bone mineral density (BMD) [28].

## CONCLUSION

Osteoporosis and Osteopenia were shown to be prevalent in this study's population of individuals with inflammatory bowel disease. Furthermore, a strong correlation between disease progression and poor bone mineral density was found. The greatest risk factor for

poor bone mineral density seems to be the illness itself. If patients with low MBD can be identified in the early stages, an appropriate preventative approach may be devised.

#### Author's Contribution:

Concept & Design of Study: Imran Arshad  
 Drafting: Shaista Zeb  
 Data Analysis: Ehsan Rahim Memon  
 Revisiting Critically: Prem Kumar  
 Final Approval of version: Imran Arshad

**Conflict of Interest:** The study has no conflict of interest to declare by any author.

## REFERENCES

1. Rebello D, Anjelly D, Grand DJ. Opportunistic screening for bone disease using abdominal CT scans obtained for other reasons in newly diagnosed IBD patients. *Osteoporos Int* 2018;29:1359–1366
2. Schule S, Rossel JB, Frey D, et al. Prediction of low bone mineral density in patients with inflammatory bowel diseases. *United Eur Gastroenterol J* 2016; 4:669–676.
3. Yoo JE, Park HS. Prevalence and associated risk factors for osteoporosis in Korean men. *Arch Osteoporos* 2018;13:88.
4. Nobile S, Grand RJ, Pappa HM (2018) Risk factors for low bone mineral density in pediatric inflammatory bowel disease: The positive role of physical activity. *Eur J Gastroenterol Hepatol* 30:471–476.
5. Sohn J, Chang EJ, Yang HR (2017) Vitamin D Status and Bone Mineral Density in Children with Inflammatory Bowel Disease Compared to Those with Functional Abdominal Pain. *J Korean Med Sci* 32(6):961–967.
6. Bernstein CN, Bector S, Leslie WD. Lack of relationship of calcium and vitamin D intake to bone mineral density in premenopausal women with inflammatory bowel disease. *Am J Gastroenterol* 2003;98:2468–73.
7. Shuhart CR, Yeap SS, Anderson PA et al (2019) Executive Summary of the 2019 ISCD Position Development Conference on Monitoring Treatment, DXA Cross-calibration and Least Significant Change, Spinal Cord Injury, Peri-prosthetic and Orthopedic Bone Health, Transgender Medicine, and Pediatrics. *J Clin Densitom* 22(4):453–471.
8. Levine A, Koletzko S, Turner D, et al. ESPGHAN revised porto criteria for the diagnosis of inflammatory bowel disease in children and adolescents. *J Pediatr Gastroenterol Nutr* 2014; 58:795–806.
9. Ewid M, Al Mutiri N, Al Omar K, Shamsan AN, Rathore AA, Saquib N, et al. Updated bone mineral density status in Saudi patients with inflammatory bowel disease. *World J Gastroenterol* 2020;26:5343–5353.
10. Jahnsen J, Falch JA, Mowinckel P, Aadland E. Vitamin D status, parathyroid hormone and bone mineral density in patients with inflammatory bowel disease. *Scand J Gastroenterol* 2002;37:192–9.
11. Maldonado FJ, Al Bawardy BF, Nehra AK, Lee YS, Bruining DH, Adkins MC, et al. Findings of CT-Derived Bone Strength Assessment in Inflammatory Bowel Disease Patients Undergoing CT Enterography in Clinical Practice. *Inflamm Bowel Dis* 2019;25:1072–1079.
12. Khadgawat R, Makharia GK, Puri K. Evaluation of bone mineral density among patients with inflammatory bowel disease in a tertiary care setting in India. *Ind J Gastroenterol* 2008;27:103–6
13. Bishop N, Arundel P, Clark E, et al. Fracture prediction and the definition of osteoporosis in children and adolescents: the ISCD 2013 Pediatric Official Positions. *J Clin Densitom* 2014;17: 275–280.
14. World Health Organization. Assessment of fracture risk and its application to screening of post-menopausal osteoporosis. Technical Report Series 843. WHO, Geneva 1994.
15. McCloskey EV, Odén A, Harvey NC, Leslie WD, Hans D, Johansson H, et al. A Meta-Analysis of Trabecular Bone Score in Fracture Risk Prediction and Its Relationship to FRAX. *J Bone Miner Res* 2016;31:940–948.
16. Krajcovicova A, Hlavaty T, Killinger Z, Miznerova E, Toth J, Letkovsky J, et al. Combination therapy with an immunomodulator and anti-TNF $\alpha$  agent improves bone mineral density in IBD patients. *J Crohns Colitis* 2014;8:1693–1701.
17. Paggiosi MA, Peel NF, Eastell R. The impact of glucocorticoid therapy on trabecular bone score in older women. *Osteoporos Int* 2015;26:1773–1780.
18. Gulyás K, Horváth Á, Végh E, Pusztai A, Szentpétery Á, Pethő Z, et al. Effects of 1-year anti-TNF- $\alpha$  therapies on bone mineral density and bone biomarkers in rheumatoid arthritis and ankylosing spondylitis. *Clin Rheumatol* 2020;39:167–175.
19. Abraham BP, Prasad P, Malaty HM. Vitamin D deficiency and corticosteroid use are risk factors for low bone mineral density in inflammatory bowel disease patients. *Dig Dis Sci* 2014;59:1878–84
20. Bokemeyer B, Picker N, Kromer D, Rosin L, Patel H. P598 Indicators for inadequate response among patients with Ulcerative Colitis treated with advanced therapies in German clinical practice. *J Crohn's and Colitis* 2022;16(Supplement\_1):i532–i533.

21. Azuma K, Ouchi Y, Inoue S, Vitamin K: novel molecular mechanisms of action and its roles in osteoporosis *Geriatr Gerontol Int* 2014;14:1-7
22. Del Carmen NM, Saavedra P, Jódar E, et al. Osteoporosis and metabolic syndrome according to socio-economic status; contribution of PTH, vitamin D and body weight: the Canarian Osteoporosis Poverty Study (COPS). *Clin Endocrinol* 2013; 78:681–6.
23. Azzopardi N, Ellul P. Risk factors for osteoporosis in Crohn's disease: infliximab, corticosteroids, body mass index, and age of onset *Inflamm Bowel Dis*, 19 2013;1173-1178.
24. Hilmi I, Sunderesvaran K, Ananda V, Sarji SA, Arumugam K, Goh KL. Increased fracture risk and osteoporosis not associated with vitamin D levels in Malaysian patients with inflammatory bowel disease. *J Clin Endocrinol Metab* 2013;98:2415–21.
25. Mouli VP, Ananthakrishnan AN. Vitamin D and inflammatory bowel diseases *Aliment Pharmacol Therap* 2014;39:125-136.
26. Oh HJ, Ryu KH, Park BJ, Yoon BH. Osteoporosis and osteoporotic fractures in gastrointestinal disease. *J Bone Metab* 2018; 25:213.
27. Sharifi A, Kashani M, Salimzadeh A, Ebrahimi M, Savadkouhi MN. Decreased bone mineral density, Vitamin K and Vitamin D in ulcerative colitis patients, *Medicina Clínica Práctica* 2021;4(4): 100276, ISSN 2603-9249.
28. Piodi LP, Poloni A, Olivieri FM. Managing osteoporosis in ulcerative colitis: something new? *World J Gastroenterol* 2014;20:14087.