Abstract
Osteovigilance is a state of clinical suspicion for abnormalities of bone and mineral metabolism, including efforts to optimize bone mineral health. In this article, we discuss various factors which contribute to coexistence of diabetes and bone mineral disease, the risk factors that they share, and iatrogenic and therapeutic considerations of importance. We highlight the need to practice osteovigilance as an integral part of diabetes management.

Keywords: Calcium, Fracture risk, Osteoporosis, Type 1 diabetes, Type 2 diabetes, Vitamin D deficiency.

Introduction
Diabetes is a common occurrence in clinics and communities across the world. Management of diabetes entails not only control of glucose, but also care of various metabolic health parameters. Many physicians tend to equate this with a focus on cardiovascular and lipid metabolism. Equally important, however, are concerns related to bone and mineral metabolism. In this article, we discuss osteovigilance in diabetes care. We define osteovigilance as a state of clinical suspicion for abnormalities of bone and mineral metabolism, including efforts to optimize bone mineral health.

Co-Existential Factors
Diabetes and bone mineral disorders often coexist with each other. This may be because of the ubiquitous nature of diabetes, as well as osteoporosis and vitamin D deficiency. Specific correlations have also been documented. While type 1 diabetes is clearly associated with a low bone mineral density, data regarding BMD in persons with type 2 diabetes is variable.

Poly glandular autoimmune (PGA) syndrome 1 may present with both hypoparathyroidism and type 1 diabetes (along with candidiasis and adrenal insufficiency). Multiple endocrine neoplasia (MEN) may involve parathyroid hyperplasia and pancreatic tumours (MEN 1 or Wermer syndrome).

Risk Factors
Disorders of bone mineral metabolism share many risk factors in common with diabetes. These include hypogonadism and menopause, which predispose to osteoporosis, and hypomagnesaemia, which is associated with osteoporosis, hypocalcaemia, and familial hypocalcaemic hypercalciuria (FHH). Hypovitaminosis D is a risk factor for cardiovascular disease, and may worsen outcomes in diabetes. Complications of bone mineral ill-health, such as sarcopenia, may impair efforts to improve physical activity in diabetes, while diabetic complications like neuropathy and retinopathy can increase fracture risk.

Iatrogenic Factors
At times, bone mineral disease may be due to
iatrogenic factors. Pioglitazone may increase the risk of fracture, especially in post menopausal women, and sodium glucose co-transporter 2 (SGLT2) inhibitors have a theoretical risk of increased fractures.9,10

Calcium absorption can be reduced in diabetes,11 and vitamin D requirements may be higher in obese persons with diabetes. These pharmacological considerations should be kept in mind while planning therapy.

**Therapeutic Approach**

One must keep a high index of suspicion for disorders of bone mineral metabolism in persons with diabetes. Regular clinical screening is mandatory, and investigations may be required if clinically indicated. Non-pharmacological lifestyle modification therapy should be chosen in a pragmatic manner, keeping musculoskeletal fitness in mind. A person with osteoporosis, for example, should not be advised high impact weight bearing exercises for glycaemic control.12 An individual at high risk of vitamin D deficiency, or with documented low levels, should be encouraged to participate in outdoor rather than indoor exercise. Motivational skills developed by endocrinologists and diabetologists may be utilized to enhance acceptance of, and adherence to, injectable anti-osteoporotic therapy such as teriparatide and denosumab.

**Summary**

Osteovigilance is an integral part of diabetes care which should be given due importance in management of diabetes. Focus on prevention, screening and management of bone and mineral disorders will help improve outcomes of diabetes management.

**References**