UNIVERSITI TEKNOLOGI MARA (UiTM)

PREVALENCE AND ASSOCIATED FACTORS OF METABOLIC BONE DISEASE IN MALE WITH TYPE 2 DIABETES MELLITUS

DR HANIS RABEAH BINTI KAMARUZAMAN

2016112663

MENUSCRIPT SUBMITTED IN PARTIAL FULFILMENT FOR THE REQUIREMENT FOR DEGREE OF MASTER IN INTERNAL MEDICINE

FACULTY OF MEDICINE

NOV 2022

AUTHOR'S DECLARATION

I declare that the work in the manuscript was carried out in accordance with the regulation of University Teknologi MARA. It is original and the result of my own work unless otherwise indicated or acknowledged as referenced work. This manuscript has not been submitted to any other academic or non-academic institution for any degree or qualification

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Name of student : Dr Hanis Rabeah binti Kamaruzaman

Student ID no. : 2016112663

Programme : Master in Internal Medicine – MD771

Faculty : Medicine

Thesis : Prevalence and Associated Factors of Metabolic Bone Disease in Male with Type 2 Diabetes Mellitus

Signature of student : …….

Date : November 2022

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Prevalence and Associated Factors of Metabolic Bone Disease in Male with Type 2 Diabetes Mellitus

Authors

1) Dr Hanis Rabeah binti Kamaruzaman[1]
2) Dr Sharifah Faradila binti Wan Muhamad Hatta[1*]
3) Dr Nur Hidayati binti Mohd Sharif[1]
4) Associate Professor Dr Zaliha binti Ismail[2]
5) En Mohd Yusri bin Idorus[5]
6) Professor Dr Thuhairah Hasrah binti Abdul Rahman[3,4,5]
7) Pn Rafezah binti Razali[4]
8) Professor Dr Rohana binti Abdul Ghani[1,5]

[1]Department of Internal Medicine, Faculty of Medicine, Hospital Al –Sultan Abdullah, UiTM Puncak Alam, 47000, Sungai Buloh, Selangor, Malaysia

[2]Public Health Medicine, Faculty of Medicine, University Teknologi MARA, 47000, Sungai Buloh, Selangor, Malaysia

[3]Chemical Pathologist, Faculty of Medicine, University Teknologi MARA, 47000, Sungai Buloh, Selangor, Malaysia

[4]Department of Clinical Diagnostic Laboratory Hospital Al –Sultan Abdullah, UiTM Puncak Alam, 47000, Sungai Buloh, Selangor, Malaysia

[5]Institute of Medical Molecular Biotechnology, Faculty of Medicine, University Teknologi MARA, 47000, Sungai Buloh, Selangor, Malaysia

Corresponding author

Dr Sharifah Faradila binti Wan Muhamad Hatta

[redacted]

Email : shfara@gmial.om.my

ABSTRACT

INTRODUCTION Postmenopausal women and people over the age of 70 are more likely to develop osteoporosis. It is recognized as significant comorbidity among those with type 2 diabetes mellitus (T2DM), and male fractures are on the rise with higher rates of mortality than women (37.5% vs 28.2% respectively). However, there is a scarcity of data linking T2DM and metabolic bone disease in men.

OBJECTIVE Our study aimed to determine the prevalence of metabolic bone diseases, including osteoporosis and osteopenia, and the associated factors, bone turnover markers, and vitamin D in male with T2DM.

METHOD This is a cross-sectional, single-centre study in men above 50 years of age with T2DM, conducted from December 2021 to June 2022. Demographic data, baseline comorbidities, and biochemical profiles including urine albumin-creatinine ratio (UACR) were obtained. Bone turnover markers including C-terminal telopeptide of type I collagen (CTX) and bone-specific alkaline phosphates (bsALP) were measured. Osteoporosis and osteopenia were determined by Dual Energy X-ray Absorptiometry (DEXA).

RESULT 148 male with T2DM with a median age of 64 (IqR 11) years was recruited. The prevalence of metabolic bone disease in the study population was 20.3%. Multivariate analysis shows total bilirubin level [OR: 1.13 (95% CI: 1.050, 1.223) p<0.001], high intact parathyroid hormone (iPTH) level ≥6.9 pmol/L [OR 3.05 (95% CI: 1.141, 8.187), p=0.026] and use of dipeptidyl peptidase-4 inhibitor (DPP4i) [OR 0.274 (95% CI: 0.093, 0.809) p=0.01] are predictors of metabolic bone disease in the study population.

CONCLUSION Metabolic bone disease affects about 1 in 5 men with T2DM patients, This study underscores the importance of screening for metabolic bone disease in men T2DM with high total bilirubin and high iPTH level to allow early detection, initiation of treatment and other preventive measures. There is need for further study looking at association of DPP4i with metabolic bone disease

Keywords: Bone mineral density, metabolic bone disease, osteoporosis, osteopenia, bone turnover marker, type 2 diabetes mellitus

Introduction

Bone metabolism involves an ongoing cycle of bone resorption and growth. The term metabolic bone disease refers to a broad category of conditions that affect bone density usually caused by abnormalities of minerals, vitamin D, and bone mass or bone structure [1]. The most common metabolic bone diseases are osteoporosis and osteopenia [1]. Osteoporosis is defined by World Health Organization (WHO) as a skeletal disorder characterized by compromised bone strength hence predisposing an individual to increased risk of fracture [2]. WHO recommended measurements of bone mineral density (BMD) in diagnosing osteoporosis and osteopenia and the use of Fracture Risk Assessment Tool (FRAX) to identify individuals at increased risk of osteoporotic fractures. Osteoporosis is a common disease in postmenopausal women and the elderly above the age of 70. Due to the rapid growth of the elderly population, fracture incidence has continued to rise [3]. Osteoporosis is a silent disease that goes unnoticed until a fracture occurs. It has a significant negative impact on individuals, including high morbidity and mortality [4-6]. However, osteoporosis in men remains underdiagnosed and undertreated. According to epidemiological studies in 2000, 39% of osteoporotic fractures occurred in men more than 50 year old [6]. In their lifetime, one in five males over the age of 50 may experience an osteoporotic fracture [7]. Osteoporosis related to diabetes mellitus is recognised but suffers from a lack of attention. The effect of T2DM on BMD and the risk of osteoporosis is still not clear. Several studies have shown increased fracture risks among T2DM even at high or normal BMD [7]. Diabetes may affect bone tissues through various mechanisms, including hyperinsulinemia, deposition of advanced glycosylation end products (AGE) in collagen, reduced serum levels of Insulin-Like Growth Factor-1 (IGF-1), hypercalciuria, microangiopathy, and inflammation [8, 9]. All of these lead to poor bone quality, which may not be represented by BMD alone. It involves many aspects of bone metabolism including bone formation, bone resorption, bone mineralization, and calcium and phosphate metabolism. Complications such as diabetic nephropathy may further worsen bone mineral metabolism as proteinuria and low estimated glomerular filtration rate (eGFR) have been demonstrated as independent risk factors for osteoporosis [10, 11].