

CHAPTER I

INTRODUCTION

1.1 Background

Osteoporosis is a skeletal disorder caused by structural deterioration of bone tissue, this usually accompanied with an increased risk for fracture. There are two form of osteoporosis primary and secondary. Primary osteoporosis, which is the common form of the disease, is caused by the loss of androgens and estrogens which induce increased bone turnover. This increase caused the bone resorption to be higher than bone formation which causes the susceptibility to fracture (Jeremy, Hilal and Maini, 2022).

Osteoporosis is still underdiagnosed and undertreated in Asia, this is argued to be caused by the limited access to DXA technology (International Osteoporosis Foundation, 2021). This disease is 4 times more prevalent on women than men, because of the loss of estrogen around menopause (Kementarian Kesehatan RI, 2015). According to a survey done in 2017, there are 28,767 women that have experienced menopause, or in other words they are postmenopausal (Badan Kependudukan dan Keluarga Berencana Nasional *et al.*, 2018).

The loss of bone density starts to rapidly increase around late perimenopausal age, which is at least 11 months since the last menstruation. This will continue until a few years of postmenopausal age (Finkelstein *et al.*, 2008). This is why, one of the important examinations for osteoporosis is the assessment for bone mineral density (BMD) in the femoral neck. Measuring BMD is also helpful in determining the risk for fracture in high risk fracture area, such as in the femoral neck (WHO, 2004).

Regular exercise is largely regarded as the most effective non-pharmacological technique for increasing and maintaining BMD (Kohrt *et al.*, 2004), as well as lowering the risk of falling. As a result, exercise has a critical role in lowering the risk of osteoporotic hip fracture (Allison *et al.*, 2013). Because the demographic at greatest risk of osteoporosis is older individuals, it has been proposed that exercise may be less helpful in older people than in younger ones (Nikander *et al.*, 2010; Srinivasan, Gross and Bain, 2012). This might be connected to the kind and intensity of the exercise treatments tested, since older persons may have worse neuromuscular function or a higher risk of injury (Allison, Brooke-Wavell and Folland, 2013). High-impact jumping activities with a large magnitude of loading at the hip have caused the biggest gains in femoral neck BMD in children and young adults (Nikander *et al.*, 2010).

High impact exercises have been proven to be effective in postmenopausal women populations. Although there are still no consensus on which form of high impact exercise that will have the most benefit in maintaining or increasing bone mineral density, especially in the femoral neck region (Martyn-St James and Carroll, 2009). In light of that, this review is aimed at the form of high impact exercise that is most beneficial in maintaining or increasing femoral neck BMD.

1.2. Research Problem

1. What might be the effect of high impact exercises on femoral neck bone mineral density ?
2. What is the most effective type of high impact exercises for preventing bone density loss in the femoral neck region?

1.3. Research Objective

General Objective

To analyze the effect of high impact exercises on bone density and the most effective type to prevent bone density loss.

Specific Objective

1. To evaluate which type of high impact exercise increases femoral neck bone mineral density the most
2. To evaluate effectivity of high impact exercises on preventing and maintaining bone density loss

1.4. Benefits

1. Having a better understanding which type of high impact exercise increases femoral neck bone density the most
2. To recommend a high impact exercise that is effective on preventing and maintaining bone density loss